Overview of Discards from Canadian Commercial Fisheries in NAFO Divisions 4V, 4W, 4X, 5Y and 5Z for 2002-2006

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ABSTRACT

Gavaris S, Clark KJ, Hanke AR, Purchase CF, Gale J. 2010. Overview of discards from Canadian commercial fisheries in NAFO Divisions 4V, 4W, 4X, 5Y and 5Z for 2002-2006. Can. Tech. Rep. Fish. Aquat. Sci. 2873: vi + 112 p.

Available information was used to characterize the discards from Canadian commercial fisheries conducted in the NAFO Divisions 4V, 4W, 4X, 5Y and 5Z during 2002 to 2006 in order to identify gaps in monitoring and to provide the basis for a triage on potential conservation concerns associated with higher discard amounts. While particular estimates from this broad scale analysis should not be accepted uncritically, the general patterns and broad comparisons are considered sufficient to identify principal fisheries lacking monitoring for discards, to detect species where discards are higher and may be an important source of mortality and to list the monitored fisheries contributing most to those discards.

Current levels of at-sea observer coverage for the principal fisheries were generally too low and intermittent to give confidence in the reliability of discard estimates. First priority could be given to improving coverage on the scallop dredge, lobster trap, groundfish longline and swordfish longline fisheries.

Despite the limitations of the available data, some broad patterns for discards could be inferred from the analyses for those fisheries which had some at-sea observer coverage. When developing plans to manage the amount of discarding, the following deserve first attention. In 4VW, discards of blue shark, porbeagle shark, shortfin mako shark and sea turtles from the swordfish longline fishery, skates and spiny dogfish from the groundfish and silver hake fisheries (the winter skate fishery is not currently active), herring and basking shark from the silver hake fishery and flounders from the shrimp fishery. In 4X5Y, discards of invertebrates, flounders, sculpins and skates from the scallop dredge fishery, blue shark, porbeagle shark, shortfin mako shark and sea turtles from the swordfish longline fishery, sculpin, skates, spiny dogfish, white hake, porbeagle shark and shortfin mako shark from the groundfish fishery, flounders and basking shark from the silver hake and redfish fisheries and cusk from the offshore lobster trap fishery. In 5Z, discards of flounders, cod, haddock and skates from the scallop dredge fishery, skates from the groundfish fisheries, blue shark from the swordfish longline fishery, cusk from the offshore lobster trap and groundfish longline fisheries and basking shark from the groundfish longline fishery.

RESUME

Gavaris S, Clark KJ, Hanke AR, Purchase CF, Gale J. 2010. Overview of discards from Canadian commercial fisheries in NAFO Divisions 4V, 4W, 4X, 5Y and 5Z for 2002-2006. Can. Tech. Rep. Fish. Aquat. Sci. 2873: vi + 112 p.

Les données disponibles ont été utilisées pour caractériser les rejets dans les pêches commerciales canadiennes pratiquées dans les divisions 4V, 4W, 4X, 5Y et 5Z de l'OPANO de 2002 à 2006 dans le but d'identifier les lacunes dans la surveillance de ces pêches et d'établir le fondement pour le classement par ordre de priorité des préoccupations que soulèvent des rejets plus importants pour la conservation. Bien que les estimations particulières issues de cette analyse générale ne devraient pas être acceptées sans faire preuve d'esprit critique, les tendances et les comparaisons générales sont considérées suffisantes pour cerner les principales pêches dont les rejets ne sont pas surveillés, identifier les espèces dont les rejets sont élevés et de ce fait peuvent constituer une importante source de mortalité, ainsi que de dresser une liste des pêches surveillées qui contribuent le plus à ces rejets.

Les niveaux d'observation des principales pêches en mer étaient généralement trop faibles et intermittents pour pouvoir accorder un niveau de fiabilité aux estimations des rejets. La priorité première pourrait être accordée à l'amélioration de l'observation des pêches du pétoncle à la drague, du homard au casier, du poisson de fond à la palangre et de l'espadon à la palangre.

Malgré les données limitées disponibles, il a été possible de dégager, des analyses des pêches ayant fait l'objet d'un certain niveau d'observation, quelques tendances générales des prises rejetées en mer. Les considérations suivantes doivent être prises en compte en premier lors de l'élaboration de plans de gestion des rejets en mer. Dans 4VW, il faut tenir compte des rejets de requin bleu, de requin-taupe commun, de requin-taupe bleu et de tortue de mer dans la pêche de l'espadon à la palangre; des rejets de raie et d'aiguillat commun dans les pêches du poisson de fond et du merlu argenté (la pêche d'hiver de la raie tachetée n'est pas poursuivie à l'heure actuelle); des rejets de hareng et de requin-pèlerin dans la pêche du merlu argenté; et des rejets de flétan dans la pêche de la crevette. Dans 4X5Y, il faut tenir compte des rejets d'invertébrés, de flétan, de chabot et de raie dans la pêche du pétoncle à la drague; des rejets de requin bleu, de requin-taupe commun, de requin-taupe bleu et de tortue de mer dans la pêche de l'espadon à la palangre; des rejets de chabot, d'aiguillat commun, de raie, de merluche blanche, de requin-taupe commun et de requin-taupe bleu dans la pêche du poisson de fond; des rejets de flétan et de requin-pèlerin dans les pêches du merlu argenté et du sébaste; et des rejets de brosme dans la pêche hauturière du homard au casier. Dans 5Z, il faut tenir compte des rejets de flétan, de morue, d'aiglefin et de raie dans la pêche du pétoncle à la drague; des rejets de raie dans les pêches du poisson de fond; des rejets de requin bleu dans la pêche de l'espadon à la palangre; des rejets de brosme dans

la pêche hauturière du homard au casier et la pêche du poisson de fond à la palangre; et des rejets de requin bleu dans la pêche du poisson de fond à la palangre.

INTRODUCTION

The unintended incidental capture of species that are not the target of a fishery is referred to as by-catch. By-catch that is retained for sale or for use is monitored as fisheries landings. By-catch that is not retained is designated as discards. Some amounts of catches of those species that could be retained for sale or use, may be discarded to comply with management regulations, e.g. size limits, license restrictions, etc. The entire catches of non-harvested species are typically discarded. Discarded fish may survive post-release, but appreciable mortality often occurs. Fisheries conservation objectives and strategies generally pertain to the total mortality generated by fisheries, i.e. landings and those discards that die. Systems for monitoring landings are typically relatively mature. Approaches for monitoring and characterizing the discards from fisheries, in a comprehensive way, have only recently begun to receive greater attention (e.g. Wigley et al. 2007).

The purpose of this study was to characterize the discards, by weight, from Canadian commercial fisheries conducted in the Northwest Atlantic Fisheries Organization (NAFO) Divisions 4V, 4W, 4X, 5Y and 5Z during 2002 to 2006 (Figure 1). Discarding that is not permitted was not addressed here. Due to the broad scale of the comparisons, these analyses are coarse. Definitive estimates of discards for any particular fishery, area and season merit investigation of more detailed and fine scale analyses. Results obtained here are compared to results from some published analyses to get an appreciation of how rough these coarse estimates are. The utility of this study is to identify gaps in monitoring and to consider these coarse estimates of discards as the first stage in a triage to prioritize potential conservation risks that may be associated with higher discard amounts.

The estimates reported here are for total discards. Accounting and adjusting for post-release survival is beyond the scope of this work. However, the nature and quantity of at-sea observations, which are collected to allow evaluation of post-release survival, are summarized. Discard mortality rate is more pertinent and informative about conservation implications than the amount of discards reported here, but requires additional knowledge about the abundance of the population. Subsequent analyses may use these results in conjunction with estimates of population abundance to derive and examine a first order approximation of discard mortality rates.

DATA & METHODS

FISHERY MONITORING AND ASSIGNING FISHERY

A wide range of commercial fishing activities is conducted in NAFO Divisions 4V, 4W, 4X, 5Y and 5Z. These activities are licensed by Fisheries and Oceans Canada (DFO) to harvest specific species in designated areas. Other conditions may include season restrictions and gear specifications. Participants in the

fisheries are required to submit documents that record their activity and the associated retained catches. Discarded catches are not typically recorded in these documents. The landings are weighed out and this information is also recorded on the submitted documents. This fishery monitoring information is maintained by DFO Maritimes Region in the Maritimes Fisheries Information System (MARFIS) database and represents a complete census of almost all commercial fishing activities. Information from commercial fisheries for marine worms, shad, eels, smelt and Atlantic sturgeon is not contained in MARFIS.

At-sea observers are also deployed on selected fishing activities to monitor and record events in greater detail than can be obtained from the submitted fishery monitoring documents. Of particular relevance to this study, the nature and location of the fishing activity is captured and the catches of all species, whether retained or discarded, are recorded. Some of the fishing activities that are selected for at-sea monitoring are for specific purposes and may not be representative of typical commercial fishery operations. However, the majority of at sea deployments are considered to be representative and constitute a sample from those fisheries for which discard information is available. The at-sea monitoring information is maintained by DFO Maritimes Region in the Industry Surveys Database (ISDB).

Several factors may affect the unintended incidental capture of species, including the nature of the fishery, the date fished and the location fished. To control for some of these effects, the discard calculations were done by fishery, year and area. A fishery designates those activities that are considered to be of a similar enough nature that their catch compositions are comparable. Sub-year calculations, say by quarter, could better account for any seasonal variation in the density of the by-catch species of interest, but limited observer coverage in many fisheries precluded temporal resolution finer than year for this broad scale analysis. Three areas, generally reflective of species assemblages, sectors and fisheries, were considered; NAFO Divisions 4V and 4W, NAFO Divisions 4X and 5Y and NAFO Division 5Z (Figure 1). Canadian fisheries in Divisions 5Y and 5Z are restricted to the Canadian portions as designated by the international boundary between Canada and the USA. In this report, these three areas are simply referred to as 4VW, 4X5Y and 5Z.

Two of the factors affecting discard calculations, area fished and date fished, are fields recorded directly in the MARFIS database. There is no field, however, to designate the fishery being prosecuted. Therefore the fishery designation had to be derived from other information in the MARFIS database. Assignment of a fishery designation was based primarily on the species for which the activity was licensed to land and on the fishing gear used (Table 1). Fisheries were grouped according to type of species for which they were licensed to land; anadromous, groundfish, small pelagic, large pelagic, invertebrate and multi-license. A few fisheries were further subdivided, based on license sub-type, to reflect differences between the inshore and offshore sectors. Some licenses pertain to

groups of species rather than a particular species. Notably, a groundfish license authorizes landing of most groundfish species. Some groundfish bottom trawl fisheries were distinguished on the basis of mesh size. Trips that did not have mesh size recorded or where the mesh size was outside the limits specified for these designated groundfish fisheries were assigned to the general groundfish bottom trawl fishery. There was a small scale fishery for sculpin that operated in a distinct manner but was licensed under the traditional groundfish fishery. It was considered appropriate to treat the sculpin fishery as a special case and distinguish it from the groundfish fishery. The trips for the sculpin fishery were identified on the basis of the DFO assigned vessel number and the landing date falling within the starting and ending dates of that fishery.

Commercial fisheries for marine worms, shad, eels, smelt and Atlantic sturgeon are not included in these analyses because their information was not captured in the MARFIS commercial fisheries statistics database. A few records in the MARFIS database (0.39%, 0.26%, 0.24%, 0.22% and 0.25% of records for 2002 to 2006 respectively), mostly involving commercial fisheries of marine plants, did not record a license identifier and thus could not be associated with a licensed species. These records could not be assigned to a fishery and were not used in any further analyses.

It was necessary to designate a fishery for each unit of fishing activity. For this analysis, a unit of fishing activity was generally a trip, even though MARFIS records information at a finer scale. A trip is defined as 'a voyage that commences at the time a fishing vessel leaves a port to engage in fishing and terminates at the time fish caught during that period are off-loaded'. Thus a trip record is typically associated with a distinct landing date for a particular vessel. Trip is used as the basic unit because it was also necessary to match information in MARFIS and ISDB (see subsequent section). Matching at a resolution finer than trip is not practical. Many, but not all, records in the MARFIS database are assigned a trip identifier. Table 2 shows the record count by year for any fisheries for which records without trip identifiers exist. The majority of these records are for coastal clam fisheries, where a vessel is not involved, and inshore lobster fishing operations, where fishing records are submitted using a summary document for several trips. For these records, a proxy trip identifier was created, comprised of the negative (to distinguish from assigned trip identifiers) of the landing date concatenated to the license identifier. Each trip identifier, or proxy trip identifier for records without trip identifiers, was assigned to a fishery.

Generally, only a single licensed species code is associated with a given fishing trip. Occasionally, more than one licensed species code is implicated. Two multiple licensed fisheries, swordfish/other tunas and lobster/Jonah crab, are fairly common and were classified under large pelagic and invertebrate fisheries groups respectively. The remaining multiple licensed trips were classified in Table 1 as the 'mix' fishery group.

DISCARD ESTIMATION

The weight of discards can be estimated from information collected by at-sea observer deployments coupled with information from fishery monitoring. Since the method relies on at-sea observation of discards, discarding that is not permitted, and therefore not done in the presence of an observer, is not addressed here. A general procedure for estimating discards involves a simple ratio estimator based on the observed discard rate and can be expressed as *DISCARDS = X (discards / x)*, where *x* is an observable variable that is correlated to *discards* (Cochran 1977). In a statistical context, the fishery is the population and the observed fishing activity constitutes the sample, with discards as the quantity of interest. Quantities that have been observed, the statistical sample, are shown in lower case while quantities shown in upper case refer to total amounts for a fishery, the statistical population. The ratio *r = discards / x* is the observed discard rate.

The ratio method is simply application of the sample discard rate estimate to the population magnitude of the quantity in the denominator of the ratio. The method relies on the ability to obtain the total of that quantity for the fishery, the statistical population. Four such quantities were considered for estimating discards here:

A) *DISCARDS = EFFORT (discards / effort)*
B) *DISCARDS = LANDINGS (discards / landings)*
C) *DISCARDS = TARGET SPECIES LANDINGS (discards / target species landings)*
D) *DISCARDS = ALL SPECIES LANDINGS (discards / all species landings)*

Unless otherwise specified, the terms discards and landings are used to refer to catches of the by-catch species of interest.

Population densities generally vary by location and over seasons and years. Therefore, results from all approaches can be sensitive to inadequate sampling of the spatial/temporal variation in the population density of the by-catch species of interest. Also, all approaches depend on the assumption that discarding practices, i.e. the discard rate for observed fishing, is representative of discarding practices for the fishery. Approach B can only be applied in situations where landing of the by-catch species of interest is permitted and occurs regularly. Approaches C and D can be susceptible to variation in culling practices for the kept species, i.e. they assume that culling practices for the kept species during observed fishing is representative of that for the fishery. For approach C, the designation of one or more target species is not always obvious in multi-species fisheries. Approach A requires a suitable measure of effort.

Under appropriate conditions and when sampling intensity is high with a large proportion of the fishing observed, all four approaches may give reliable results. The variability of the respective discard rate associated with each approach influences how much observed sampling is required to obtain a representative view of the fishery. In principle, a discard rate ratio with smaller variance would

be preferable, assuming biases are negligible. An estimate of the variance for the ratio is

$$\hat{\sigma}_r^2 = \frac{\sum_i (discards_i - rx_i)^2}{n-1} \Big/ n\bar{x}^2 \quad \text{(Cochran 1977)}$$

where *x* represents either *effort*, *landings*, *target species landings* or *all species landings* and *r* is the respective ratio for each of these (*discards / effort*, *discards / landings*, *discards / target species landings* or *discards / all species landings*) and *n* is sample size (number of observed fishing events used in calculating the ratio).

In practice however, operational considerations limit the application of one or more of these approaches. For the broad scale analysis considered here, a consistent approach that could be applied across all fisheries was desired. Approach B was rejected because all by-catch species of interest are not regularly landed. Approach C was rejected due to complications with designating target species for several fisheries. Approaches B and C may perform well or even better than approaches A and D in any particular circumstance. However, approaches A and D were more practical for this broad scale application. Approach A can be complicated by definition of a measurable unit of effort. A refined measure of effort may be devised for a particular situation, but for this broad scale analysis a coarse measure that could be applied across all fisheries was days fished. Even days fished presented difficulties with the recorded information for some fisheries, e.g. identifying days fished for bluefin tuna fisheries when nothing is caught on a particular day requires an involved procedure. Approach D was deemed most suitable for this broad scale study. While approach D was adopted for the analyses, results using approach A were similar, though somewhat lower for the highest discard amounts (Figure 2).

All the results for estimated discards that follow were therefore based on the formula *DISCARDS = ALL SPECIES LANDINGS (discards / all species landings)* and were computed by fishery, year and area. The required elements on the right side of the equation were obtained from the two DFO databases, MARFIS, which contains complete landings and effort census information for the prosecuted fisheries, and ISDB, which contains sampled information for at-sea observed fishing activity, including by-catch and discards. In order to apply the calculating formulas to each assigned fishery by year and area, it was necessary to match ISDB records to MARFIS records, and to tally *ALL SPECIES LANDINGS*, *all species landings* and *discards*.

MATCHING MARFIS AND ISDB RECORDS

The observed *discards* were obtained from ISDB. The ratio method requires the observed *all species landings* and the fishery *ALL SPECIES LANDINGS* to be monitored, measured and recorded in a consistent manner. Therefore, both were obtained from MARFIS. In order to identify the observed *discards* associated with the observed *all species landings*, it was necessary to match the MARFIS and ISDB fishing trips. The ISDB database contains observed records for fishing

activity by vessels registered with other nations as well as Canadian registered vessels. Further, some fishing activity is conducted for special purposes and does not represent standard fishing practices. Only standard commercial fishing records from 4VW, 4X5Y and 5Z for Canadian registered vessels were selected for this analysis. Matching was based on the DFO assigned vessel number, the landed date and gear used. The codes for gear differ between the two databases and do not have a one-to-one correspondence. Table 3 lists the associations used. There are occurrences where the landed dates for a trip recorded on the two databases do not correspond, typically differing by a day. When an ISDB landed date could not be matched to a MARFIS landed date, matching of trips was attempted by checking the dates fished. Some trips for Canadian registered vessels conducting standard fishing operations in 4VW, 4X5Y and 5Z in the ISDB database could not be successfully matched to trips in the MARFIS database. The percentage of trips that could not be matched was 6%, 4%, 5%, 5% and 5% for 2002 to 2006, respectively. The observed discard rate estimates from these trips could not be used but all trips in MARFIS were included in the total *ALL SPECIES LANDINGS*.

TALLY LANDINGS AND DISCARDS

For each year in each of the three broad areas (4VW, 4X5Y, 5Z), *ALL SPECIES LANDINGS* was the sum of all landings for each trip assigned to a fishery and *all species landings* was the sum of all landings for each observed trip assigned to a fishery, based on records in the MARFIS database. The values for *ALL SPECIES LANDINGS* and *all species landings* were both derived from MARFIS to ensure that potential inconsistencies in recording of weight between the two databases did not influence results, e.g. weight may be estimated based on volume for ISDB but weighed out on scales for MARFIS. The values for *discards* were obtained from ISDB, hence the requirement to match trips in MARFIS and ISDB. The estimated weight of discards for each entire trip that was observed is needed for the quantity *discards*. However, due to operational constraints, only a portion of the fishing activity on an observed trip may be witnessed for some types of fishing operations. The discards from that witnessed portion are expanded to discards for the entire trip within a broad area using duration fished, $discards = duration\ (discards_{witnessed} / duration_{witnessed})$. Both total duration for an observed trip and witnessed duration are derived from the ISDB records, again ensuring consistency in the way they are monitored, measured and recorded.

RESULTS

COVERAGE

The total *ALL SPECIES LANDINGS* and observed *all species landings* by fishery, area and year for Canadian fisheries prosecuted in 4VW, 4X5Y and 5Z are tabulated in Appendix 1. The percentage of *ALL SPECIES LANDINGS* that was observed is also indicated in the table. There were 216 MARFIS trips (about 0.026%) that were associated with more than one fishery, e.g. used more than one gear on a trip. For these trips, landings from the entire trip were included for

both fisheries. While this may somewhat distort the calculations, it does not necessarily inflate the estimated discards. Further, many of these trips were from fisheries that did not have any observer coverage and therefore were not used to estimate discards. In any event, the percentage of trips associated with more than one fishery is so low that the impact is of no practical consequence. The landings associated with fisheries in the multi-license category were low. Several other fisheries also have low landings or have not persisted through 2006. For this report, attention was focused on the fisheries with appreciable landings. The total *ALL SPECIES LANDINGS* by major fisheries and the percentage of these landings that were observed for each area are shown graphically in Figures 3-5.

The fisheries with high landings in 4VW were HKS-OTB, CLB-DR, LBA-FPO, PAN-OTS, CRQ-FPO, HER-PS and HER-GN (Figure 3). Lower, but fairly consistent landings across years were recorded for GRO-LLS, SCA-DR-OF and SWO-LL. Of these principal fisheries, only the snow crab trap fishery had consistent observer coverage across years of about 10%. The silver hake bottom trawl and swordfish longline fisheries had reasonably consistent coverage over years but this was still generally below 10%. Coverage of the herring purse seine fishery was good in earlier years but was low in recent years. The other principal fisheries in this area had variable and typically low coverage with sporadic high coverage.

There is greater overall fishing activity in 4X5Y compared to the other two areas. The fisheries with high landings were GRO-OTB, GRO-LLS, SCA-DR, SCA-DR-OF, LBA-FPO, HER-PS and HER-FWR (Figure 4). GRO-GNS, RED-OTB, CLM, HER-GN and MAC-FPN also had appreciable, though lower, landings. While landings for SWO-LL and BFT-LTL were not high, activity measured as effort days fished was relatively high. Observer coverage of most fisheries in 4X5Y was generally very low and inconsistent or completely absent, the sculpin bottom trawl fishery being an exception. The redfish bottom trawl, offshore lobster trap and bluefin tuna angling fisheries had reasonably consistent annual coverage approaching 10%. Coverage of the swordfish longline fishery was 12% in 2002 and 2003 but lower since then.

The fisheries with high landings in 5Z were GRO-OTB, and SCA-DR-OF with landings for GRO-OTB-OF and GRO-LLS being somewhat lower but also consistent (Figure 5). Similar to large pelagic fisheries in the other areas, landings by SWO-LL and SWO-HAR were low but effort days fished were appreciable. Observer coverage for the groundfish bottom trawl and longline fisheries was generally about 10% or higher. Routine observer coverage for the scallop fishery was initiated in 2004 and was between 5% and 10% annually in 2005 and 2006. The swordfish harpoon fishery had no coverage and the swordfish longline fishery had variable coverage by year with one year, 2002, at about 30%.

DISCARDS

Estimated discards for 2002-2006 (Appendix 2 for area, fishery and year by discarded species, Appendix 3 for area, discarded species and year by fishery) are tabulated only to support the broad comparisons made in this analysis. Particular estimates should not be construed as definitive or accepted uncritically. For the purpose of summarizing results, species were classified into three categories; licensed species, species of potential concern and other species. The licensed species are those for which licenses have been issued to conduct managed fisheries. Species of potential concern are those for which there has been concern expressed about depletion, possibly requiring measures to conserve or rebuild the populations, and are typically not licensed for fisheries in the area being considered.

The weight discarded by each of the fishery groups, i.e. groundfish, invertebrate, large pelagic or small pelagic, in an area is shown graphically by year for those species incurring the highest discards within each of the species classifications (Figures 6-14). Further details for select species are shown by fishery. In the latter detailed figures, bars on the negative side of zero are used to denote absence of observer coverage as distinct from true zero discards when there is observer coverage. To give the magnitude of discards some context, average annual landings during 2002-2006, where available, are indicated in the figure captions.

Overall fishing activity in 4VW is currently low due to the moratorium for cod. Nevertheless, groundfish fisheries continued to account for discards of some licensed species (Figure 6), notably herring, winter skate and Atlantic halibut. The herring discards arise in the silver hake fishery. Winter skate discards occurred in several groundfish fisheries, including the winter skate fishery. The single high discard estimate for other sharks was due to groundfish longline and was not considered representative (see below). Most of the snow crab was discarded in the snow crab fishery due to mandatory release of all females and size regulations for males. Discards of blue shark were attributed to the swordfish longline fishery, as were regulatory discards of undersized swordfish. For species of potential concern (Figure 7), discards of thorny skate were attributed to several groundfish fisheries. The silver hake fishery accounted for most of the discarded spiny dogfish, though high catches also occurred in redfish and groundfish offshore otter trawl fisheries during particular years. Discards of sea turtles and porbeagle shark were primarily from the swordfish longline fishery. The high, and anomalous, discard estimate for northern wolfish in 2006 was due to groundfish longline (see below). For other species, only small amounts of other dogfish, squid and marlin were discarded (Figure 8). The other dogfish were discarded principally by the groundfish longline fishery. There were only three groundfish longline trips observed in 2006, one of which had an anomalous catch of Portuguese shark and another which caught an appreciable amount of northern wolfish. The high estimates for discards of other sharks and of northern wolfish by groundfish longline in 2006 were not considered representative.

Of the three areas, fishing activity and effort is greatest in 4X5Y. However, as noted above, observer coverage is limited. This caveat should be kept in mind when examining estimates of discards. Discards for licensed species are shown in Figure 9. The bulk of the discarded herring were by the herring purse seine fishery when they released the fish without completely pursing the seine if the sample of fish was rejected. While observer coverage was lower after 2004, it is not clear why the estimated herring discards declined and why discards of other species are not recorded in 2005 and 2006 (except lumpfish in 2005). The representativeness of sampled trips and the consistency of observer recording practices on purse seine trips could be investigated. Spiny dogfish were primarily discarded in groundfish fisheries, although occasionally also from the herring purse seine fishery. The estimate of discards for spiny dogfish in 2002 by groundfish gillnet fisheries was based on a single observed trip and was not considered representative. Most of the scallop discards were attributed to the scallop dredge fishery. Lobster was discarded by groundfish and other invertebrate fisheries by regulation while discards from the lobster trap fishery were due to regulatory size limits and mandatory release of berried females. Jonah crab was primarily discarded by lobster trap and scallop dredge fisheries. The scallop dredge fishery also accounted for most of the sea cucumber, rock crab, sculpin and sea urchin discards. Groundfish trawl and longline fisheries are required to discard undersized Atlantic halibut and account for almost all discards of that species. Blue shark discards were attributed almost entirely to the swordfish longline fishery. Skates head the list for discards of species of potential concern (Figure 10). The groundfish bottom trawl and longline fisheries accounted for most of the skate discards with some contribution from scallop dredge fisheries. The groundfish fisheries also accounted for the bulk of the white hake and porbeagle shark discards while discards of sea turtles were mostly attributed to the swordfish longline fishery. Other species discarded are principally invertebrates and were attributed primarily to the scallop dredge fishery (Figure 11). Groundfish and scallop dredge fisheries contributed appreciably to discards of other skates.

In 5Z, the highest discards of licensed species occured for scallop by invertebrate fisheries, primarily due to release of undersized scallop by the scallop fishery as required by regulation (Figure 12). Large amounts of flounders as well as lesser amounts of cod and haddock were also discarded from invertebrate fisheries by regulation. Lobster was discarded by groundfish and invertebrate fisheries, again by regulation. Small amounts of Jonah crab were discarded by invertebrate fisheries. Closer examination of lobster discards revealed that the main fisheries contributing to discards were the lobster trap fishery itself, the scallop dredge fishery and the groundfish bottom trawl fisheries. The only appreciable discards of flounders, cod and haddock were due to the scallop dredge fishery. The lobster and scallop fisheries accounted for discards of Jonah crab. Skate species had the highest discards amongst the species of potential concern in 5Z and these were due primarily to scallop dredge, groundfish bottom trawl and

groundfish longline fisheries (Figure 13). Discards for cusk, while low, were due to lobster trap and groundfish longline fisheries. Smaller amounts of discards occurred only in some years for basking shark. The scallop dredge fishery accounted for most of the discards of other species (Figure 14), including monkfish, other skates and sculpin. The groundfish otter trawl fishery also contributed to the other skate discards and together with the groundfish longline fishery accounted for all the spiny dogfish discards.

FINER RESOLUTION OF FISHERIES

The assignment of records to fisheries is limited by the nature, accuracy and completeness of the information that is available in MARFIS that can be used to distinguish the various types of fishing operations. There may be differences in the way that fishing operations are conducted within the fishery classifications used here, which may affect the nature of the by-catch and discards. In particular, vessels operating under a groundfish license may fish in different ways depending on the species they are trying to catch. The information collected for the MARFIS fishery statistics database is not sufficient to distinguish distinct fisheries based on such differences. However, the ISDB observer database records the species sought. While this information cannot be used to estimate discards separately for these distinct operations, it can be examined to evaluate if there are differences in the discard profiles.

Specifically, fishing where Atlantic halibut is the designated species sought can be separated from GRO-LLS and fishing where pollock is the designated species sought can be separated from GRO-OTB and GRO-OTB-OF. The species composition of discards from these fishery components were summarized and compared for the recent decade, 1996-2005. It was possible to examine a longer time period for these comparisons because they do not involve matching observer information with the fishery statistics database, whose format changed in 2002.

When Atlantic halibut was the designated species sought by vessels using longline gear, there was a greater tendency to capture species such as black dogfish, sharks and Northern wolffish that were not commonly observed for GRO-LLS (Figure 15). Both types of fishing operations had appreciable by-catches of spiny dogfish and skates. Discard amounts of halibut (recall that undersized halibut must be released) were excluded for this comparison. As might be expected, discards of halibut were substantially higher when halibut was the species sought and their inclusion in the summary would have complicated interpretation of comparisons for the other species.

When pollock was the designated species sought by vessels using bottom trawl gear, the species composition of discards was not too dissimilar from GRO-OTB and GRO-OTB-OF (Figure 16), with the by-catch from both types of operations showing appreciable amounts of spiny dogfish and skates with some lobster.

However there was a greater tendency to capture sharks when pollock was the species sought.

SURVIVAL OF RELEASES

This report summarizes total discards. It is beyond the scope of this study to adjust total discards for survival of releases. Such adjustments should be considered when definitive estimates of discard mortality are derived for particular fisheries. There are several examples of how such adjustments are made. The International Commission for the Conservation of Atlantic Tunas (ICCAT) considers post-release survival, which was determined using at sea observations, to account for dead discards of bluefin tuna and swordfish in their respective assessments (ICCAT 2009a, ICCAT 2009b). Satellite pop-up tags have allowed an alternative direct calculation of North Atlantic blue shark post-release survival from pelagic longline fishing (Campana et al. 2009). In an indirect application, post-release survival studies for Atlantic halibut were used to establish a minimum size that could be retained by the fishery (Neilson et al. 1989). For this report, information collected by observers that pertains to survival of releases is simply summarized to give an indication about potential use of such data.

Observers may record information about whether by-catch species were alive, dead or shark bitten when landed ('condition of fish'), how by-catch species were caught ('capture type'), and whether they were alive, uninjured, injured or dead upon release ('release type'). A summary of the type of information that can be collected is in Table 4. This information may be used to infer short-term survival of discards, but was only recorded for a few fisheries, specifically the fisheries targeting large pelagic fish (swordfish, tunas, porbeagle shark) and the offshore scallop dredge fishery. Table 5 shows the number of observed trips by fishery for which this information was collected from 2002 to 2006. Tables 6, 7 and 8 show the number of records where 'Condition of Fish', 'Capture Type' and 'Release Type' observations were recorded in the ISDB database by fishery and species for areas 4VW, 4X5Y and 5Z respectively. The 'Condition of Fish' field may include observations for retained fish as well as discarded fish. Often, the number of specimens for which there are observations on 'Capture Type' and 'Release Type' matches, but the mis-matches suggest that all these fields are not consistently recorded.

COMPARISONS WITH OTHER ESTIMATES

This report uses a coarse common procedure to achieve comparability of discard estimates across all fisheries for three broad areas. More refined by-catch and discard calculations are available for specific circumstances in 4VW, 4X and 5Z. Comparison of results from this report against published results from the more refined calculations can serve to qualify the reliability of this coarse evaluation and may shed insight on some of the other factors that could be important when considering by-catch and discard rates.

Offshore Scallop Dredge Fishery in Division 5Z

The results from this report were compared to the published discard calculations for Atlantic cod, yellowtail flounder and haddock from the offshore scallop dredge fishery in 5Z (Figure 17). The discard estimates for cod and haddock derived in this report were similar to published estimates (Gavaris et al. 2007, Van Eeckhaute and Gavaris 2006, Van Eeckhaute et al. 2005), but those for yellowtail flounder were different in 2002 and particularly 2004. The published results calculated discards on a finer temporal scale, taking seasonal patterns into account, and applied a refined measure of total scallop fishery effort to the observed discard rate rather than expanding to total landings. During the earlier years (prior to 2004), a model with seasonal factors was employed to 'interpolate' for missing observations.

Inshore Scallop Dredge Fishery in Scallop Fishing Area 29

Estimates of lobster by-catch, all of which must be discarded, from the inshore scallop dredge fishery in Scallop Fishing Area 29 (part of 4X) for 2002 to 2006 were reported in Smith et al. (2007). The by-catch of lobster on observed trips was expanded to the by-catch of lobsters by the Full Bay and the East of Baccaro scallop fleets based on landed weight of scallop meats. The results for both fleets from Smith et al. (2007) were combined in order to compare with the current analysis. The published estimates are total number of lobsters while this report used estimated weight of lobsters. The trends, however, should be comparable. With the exception of 2002, the trend in the published lobster by-catch in Scallop Fishing Area 29 was similar to that estimated in the current analysis for the whole of 4X5Y (Figure 18). This, in part, is a reflection that the highest observer coverage in the scallop fishery is for Scallop Fishing Area 29 (one observed trip per vessel per year) and thus this area dominates the current analysis.

Smith et al. (2007) also conducted a preliminary analysis of the presence/absence of by-catch species in the observed catches for 2001 to 2005 and related the information on lobster and fish species to three different bottom types: glacial till, thin sand, and till and silt. High by-catch of lobster and monkfish occurred on all bottom types. Winter flounder and thorny skate were common on glacial till and thin sand, while yellowtail flounder and skates were more common on till and silt. Smith et al. (2008) reported the estimated tonnages of by-catch species other than lobster in Scallop Fishing Area 29 based on the observer database from 2001 to 2007. The species with the highest by-catch from 2002 to 2006 were Jonah and rock crabs. Sculpins, skates, monkfish and flounder were the major fish species in the by-catch. These results generally agree with the current analysis.

Shrimp Trawl Fishery on the Eastern Scotian Shelf

Koeller et al. (2006) estimated total number and weight of by-catch from the commercial shrimp fishery on the eastern Scotian Shelf by expanding the species caught during the shrimp survey to the annual commercial landings of shrimp for the years 1995 to 2004. This calculation assumed that the locations sampled by

the survey were representative of the spatial distribution of the commercial fishery and that the catchabilities of the by-catch species for all commercial vessels and gears were the same as for the survey trawl. In the current analysis there was no observer coverage of the shrimp fishery in 2002 and 2003 so only 2004 could be compared with Koeller et al. (2006). The calculations of Koeller et al. (2006) showed that other flounders, followed by herring, then turbot and then capelin were the largest by-catch species in 2004 (Figure 19). The current analysis showed similar trends although more turbot were caught than other flounders and there were fewer capelin, herring and silver hake than in the analysis of Koeller et al. (2006). In aggregate, the results have commonalities, for example both methods show that other flounders were dominant in the by-catch in 2004, but the details diverge. Some of the differences likely occurred because there was no observer coverage in Shrimp Fishing Area 14, where the survey caught capelin (Koeller et al. 2006) and the survey did not cover the Sable Island Bank area, which is where much of the observer data came from.

Herring Purse Seine Fishery in Divisions 4WX

In a previous study, incidental catch in the 4WX herring purse seine fishery was calculated for 1991 to 1998 (Stephenson et al. 1999). Although there is no temporal overlap with the current study, there are some similarities in the species caught. Dogfish were the major by-catch species in both the current study and that of Stephenson et al. (1999), whereas other species such as cod and the occasional whale, blue shark and monkfish were also reported in both. In both the current study and that of Stephenson et al. (1999) the incidence and magnitude of by-catch in the purse seine fleet was generally low, although the estimates in both cases were influenced by the low observer coverage.

Swordfish/Other Tuna Longline Fishery

Brazner and McMillan (2008) estimated the number of loggerhead turtles discarded from the large pelagic longline fishery based on four geographic regions: the Grand Banks (NAFO Subarea 3), the Central Region (4V), the Western Scotian Shelf/Georges Bank (NAFO Divisions 4W, 4X and 5Z) and the U.S. region (NAFO Subarea 6). The estimates of Brazner and McMillan (2008) from the Central Region and Western Scotian Shelf/Georges Bank were combined to compare to the combined estimates for 4VW, 4X/5Y and 5Z from the current analysis. The current analysis estimated discards in weight, rather than number. In order to convert this estimate to numbers, the average weight of the turtles caught was calculated by dividing the sum of the estimated discard weight by the sum of the number of turtles caught on observed trips for each of the years 2002 to 2006. The total estimated turtle by-catch was then divided by the average weight to get an estimate of the number of turtles discarded. In 2002 and 2003 the estimates are fairly close. For 2004 to 2005, estimated discard numbers from Brazner and McMillan (2008) were greater than the current analysis while for 2006, the current analysis estimated higher discards (Figure 20). The order of magnitude and the overall trend in the data calculated by both methods is similar, with a decrease in the discard numbers in 2004 and a

considerable increase in 2005 and 2006. Despite the agreement, the magnitude of the estimates is suspect due to the low observer coverage, large area fished and the occurrence of sporadic trips with appreciably higher by-catch of turtles. Alternative stratification schemes and estimators that are robust to outliers could be investigated.

Swordfish and bluefin tuna dead discards from the swordfish/other tuna longline fisheries were calculated annually for west and east of 60°W (Lester et al. 2008) using the methods of Porter et al. (1999, 2000). For each area, the estimated dead discards were calculated as the observed dead discards of either bluefin tuna or swordfish multiplied by the ratio of the total swordfish landings to the weight of the observed swordfish landings. A proportion of the discarded bluefin tuna and swordfish were determined to be live at release and were therefore not included in these estimates. The proportions of the discards determined to be dead were estimated to be about 43% of the bluefin tuna and 65% of the swordfish that were released. In order to compare the dead discard estimates of Lester et al. (2008) to the total discard estimates of the current analysis, the dead discards of bluefin tuna and swordfish were adjusted to total discards using the post-release mortality estimates of 43% and 65% respectively. The results for west of 60°W were compared to the combined discards from 4VW, 4X5Y and 5Z, which is slightly greater area. The published discard estimates were generally comparable to results from this report (Figure 21). The greatest discrepancies were for swordfish in 2004 and 2005 and for bluefin tuna in 2003.

Spiny Dogfish Bycatch

By-catch of spiny dogfish from several fisheries was estimated by multiplying the observed by-catch of spiny dogfish by the ratio of total reported landings of the target species to the observed landings of the target species catch (Campana et al. 2007). Estimates were obtained by fishery, NAFO area, season and year and then aggregated. The designation of fisheries was slightly different than the current analysis. For the purpose of comparison, the GRO-OTB and GRO-OTB-OF estimates and the RED-OTB and RED-OTB-OF estimates from the current study were combined. The results are shown in Figure 22. There is fairly good agreement between the estimates from the two sources for most of the more active fisheries: 4VW silver hake, 4X groundfish longline, groundfish bottom trawl and groundfish gillnet (as noted previously, the high 2002 estimate in the current analysis was not representative), 4X redfish bottom trawl and 5Z groundfish longline and groundfish bottom trawl, although the estimates differed somewhat in some years. There is less agreement for most of the less active fisheries: 4VW groundfish otter trawl, groundfish longline and redfish otter trawl, 4X silver hake and herring purse seine and 5Z groundfish gillnet fisheries. Some of the differences may be due to low observer coverage in some fisheries, affecting both methods, and to complexities with determining target species for the methodology of Campana et al. (2007).

SUMMARY

Available information was used to characterize the discards from Canadian commercial fisheries conducted in the NAFO Divisions 4V, 4W, 4X, 5Y and 5Z during 2002 to 2006 in order to identify gaps in monitoring and to provide the basis for a triage on potential conservation concerns associated with higher discard amounts. These results may inform the development of an action plan to address discards. All commercial fisheries except those for marine plants, marine worms, shad, eels, smelt and Atlantic sturgeon were considered. Recreational fisheries were not included.

The estimates of discards reported here rely on information from at-sea observations, which are collected under less than ideal conditions. All practical measures are taken to ensure the integrity of the data. Nevertheless, an appreciation of the nature and limitations of the data can guide interpretation of results. The reliability of estimated weights and of species identification are of particular note for the results of this study. It should be recognized that the weight discarded is typically estimated, as weighing is often not practical. Best practices are employed to obtain reliable estimates of weight discarded, but the limitations of the work environment suggest that weights for small organisms may have high variation or even biases. While observers are provided with training to identify the various fish and invertebrate species which inhabit the Scotian Shelf region, some groups of species, e.g. skates and flounders, are difficult to identify, particularly at small sizes. Comparison with species composition obtained from surveys indicated some disparities for the skates. Therefore, care should be exercised when interpreting results for individual skate species. In addition to these caveats about the data, it is widely speculated that fishing practices may be altered on observed trips, compromising their representativeness. However, it is generally acknowledged that this is less likely to occur when observer coverage is higher. When deriving definitive estimates of discards for any particular case, it is recommended to compare observed and unobserved trips with respect to factors that may be important for discard rates, such as the spatial distribution and the seasonality of the fishing activity. Despite all the inherent limitations of at-sea observations, they can be informative when properly interpreted.

Total discards were reported for this study. At-sea observations could be used to evaluate post-release survival. One recent study reported good agreement between at-sea observations of fish condition and survival of skate held in tanks (Enever et al. 2009). However, currently available at-sea observations on the condition of released fish are very limited and a review of protocols would be warranted before wide scale adoption of the practice. In circumstances where post-release survival is low, it may be more practical to simply assume that all discards will suffer mortality.

This report does not purport to provide definitive estimates of discards for use in assessments of fisheries management. While results from this report against published studies were generally comparable, there were important differences.

This suggests that detailed examination of the factors affecting discard rates could be used advantageously to refine estimates of discards on a case by case basis. Due to the generally low at-sea coverage, particular estimates of discards reported in Appendices 2 and 3 should not be accepted uncritically. Consideration should be given to the specific circumstances when interpreting these results, e.g. instability of estimates across years, or sporadic higher by-catches. However, the results should be sufficient for describing the general patterns and making the broad comparisons necessary to identify principal fisheries lacking monitoring for discards, to detect species where discards are higher and may be an important source of mortality and to list the monitored fisheries contributing most to those discards. A noteworthy caveat is the possibility that a fishery lacking the monitoring information to estimate discards might also contribute appreciably to the discard mortality. Care should also be used when interpreting results for rarely caught species, particularly when there is low coverage, where they could be missed altogether or alternatively, the expansion to the fishery exaggerates the estimate.

It is reasonable to give first emphasis for observer coverage to those fisheries with the greatest fishing activity, as determined from general consideration of both landings and effort. Current levels of at-sea observer coverage for many of the principal fisheries were generally too low and intermittent to give confidence in the reliability of discard estimates. Observer coverage is expensive and deployment should be done strategically to attain the best value. Due to the nature of some fisheries, either negligible or no by-catch might be anticipated. It would not be cost effective to deploy routine observer coverage for these fisheries. In circumstances where by-catch is expected to be low, it may be necessary to deploy fairly high coverage to get meaningful statistical analyses, but this can be done periodically rather than routinely. For many fisheries however, by-catch is common but potentially variable. For these fisheries it will be necessary to deploy routine observer coverage at levels that are sufficient to derive reliable estimates of by-catch rates. Table 9 shows a proposed classification for the principal fisheries examined in this report relative to these characteristics. Based on this information and on the magnitude of estimated discards, first priority could be given to improving coverage on the scallop dredge, lobster trap, groundfish longline and swordfish longline fisheries.

By-catch and discarding of incidentally caught species is common in commercial fisheries. The induced discard mortality may be inconsequential, but a full appreciation of the conservation implications requires monitoring of both discards and population abundance and must be judged against the productivity of the resource. For many species, this knowledge is not available. A practical first step in the triage is to give first attention to those species where discards are highest. This does not preclude giving special consideration to any particular species for which there is concern but for which discards are lower. Despite the limitations of the available data, some broad patterns for discards could be inferred from the analyses for those fisheries which had some at-sea observer coverage. Tables

10-12 summarize the species with important discards in each area and indicate those fisheries which contribute most to the discards. Importance was determined on the basis of amount, consistency and reliability of the estimates.

Regulatory requirements that prescribe discarding, as well as the survival of those releases, are important considerations for the management of by-catch and when interpreting the impact of discards on the population and ecosystem dynamics. Many harvested species are required to be discarded by regulation, due to size restrictions, sex and maturity of fish or capture by fisheries not licensed to land that species. In several cases the released fish are thought to have appreciable survival, notably discards of scallop, lobster, various crab species, herring (pursed but released before 'drying up') and Atlantic halibut . Species which are discarded by regulation, predominantly by the fisheries licensed for that species, are highlighted in Tables 10-12.

Focus could be placed on the species in Tables 10-12 that are not highlighted, and on the fisheries contributing to their discards, when developing plans to manage discarding. In 4VW first attention could be given to discards of flounders from the shrimp fishery, blue shark, porbeagle shark, shortfin mako shark and sea turtles from the swordfish longline fishery, skates and spiny dogfish from the groundfish and silver hake fisheries (the winter skate fishery is not currently active), and herring and basking shark from the silver hake fishery. In 4X5Y first attention could be given to discards of invertebrates, flounders, sculpins and skates from the scallop dredge fishery, sculpin, skates, spiny dogfish, white hake, porbeagle shark and shortfin mako shark from the groundfish fishery, blue shark, porbeagle shark, shortfin mako shark and sea turtles from the swordfish longline fishery, flounders and basking shark from the silver hake and redfish fisheries and cusk from the offshore lobster trap fishery. In 5Z, first attention could be given to discards of flounders, cod, haddock and skates from the scallop dredge fishery, skates from the groundfish fisheries, blue shark from the swordfish longline fishery, cusk from the offshore lobster trap and groundfish longline fisheries and basking shark from the groundfish longline fishery.

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Table 1. The list of Canadian commercial licensed fisheries operating in NAFO Divisions 4V, 4W, 4X, 5Y and 5Z that were recorded in MARFIS for 2002-2006. Offshore sectors are identified by their license. Mesh size was used to distinguish some groundfish fisheries. Unbolded fisheries did not have observer coverage during 2002-2006.

Fishery	Description
GRO	*Groundfish*
GRO-OTB	Groundfish bottom trawl
GRO-OTB-OF	Groundfish bottom trawl offshore
GRO-OTM-OF	Groundfish midwater trawl offshore
GRO-SN	Groundfish seine
GRO-SN-OF	Groundfish seine offshore
GRO-LLS	Groundfish longline
GRO-LHP	Groundfish handline
HAG-FPO	Hagfish trap
GRO-GNS	Groundfish gillnet
YEL-OTB[1]	Yellowtail flounder bottom trawl
HKS-OTB[2]	Silver hake bottom trawl
RED-OTB[3]	Redfish bottom trawl
RED-OTB-OF	Redfish bottom trawl offshore
SKW-OTB[4]	Winter skate bottom trawl
SCU-OTB	Sculpin bottom trawl
INV	*Invertebrate*
CLM	Clam
CLM-HS	Clam hard shell
CLQ-DR	Quahaug dredge
CLB-DR	Surf clam dredge
OYA	Oyster
SCA-DR	Scallop dredge
SCA-DR-OF	Scallop dredge offshore
WHX	Whelk
CUK-DR	Sea cucumber dredge
URC-DR	Urchin dredge
URC-DIV	Urchin diver
LBA-FPO	Lobster/Jonah trap
LBA-FPO-OF	Lobster/Jonah trap offshore
CRJ-FPO	Jonah crab trap
CRJ-FPO-OF	Jonah crab trap offshore
CRS-FPO	Spider/Toad crab trap
CRK-FPO	Rock crab trap
CRQ-FPO	Snow crab trap
CRR-FPO	Red crab trap
JR-FPO	Jonah/Rock crab trap
PAN-FPO	Shrimp trap
PAN-OTS	Shrimp bottom trawl

Fishery	Description
PELS	*Small Pelagic*
HER-OTM	Herring midwater trawl
HER-SB	Herring beach seine
HER-PS	Herring purse seine
HER-GN	Herring gill net
HER-FPN	Herring trap
HER-FWR	Herring weir
HM-OTM	Herring/Mackerel midwater trawl
HM-GN	Herring/Mackerel gillnet
HM-PS	Herring/Mackerel purse seine
MAC-GN	Mackerel gillnet
MAC-LHP	Mackerel handline
MAC-FPN	Mackerel trap
MAC-FWR	Mackerel weir
PELL	*Large Pelagic*
SWO-LL	Swordfish/other tuna longline
SWO-LTL	Swordfish/other tuna angling
SWO-HAR	Swordfish/other tuna harpoon
TUN-LL	Bluefin tuna longline
BFT-LHP	Bluefin tuna tended line
BFT-LTL	Bluefin tuna angling
BFT-FPN	Bluefin tuna trap
BFT-HAR	Bluefin tuna harpoon
SHX-LL	Shark longline
ANC	*Anadromous*
ALE-GN	Alewives gillnet
ALE-FPN	Alewives trap
MIX	*Multi-license*
M-GH-GN	Groundfish/Herring gillnet
M-GS	Groundfish/Swordfish
M-HHM	Herring/Herring/Mackerel
M-SL	Swordfish/Lobster
M-ST1	Swordfish/other tuna mix1
M-ST2	Swordfish/other tuna mix2
M-ST3	Swordfish/other tuna mix3

[1] greater than 152 mm mesh in NAFO Division 5Z
[2] 45-89 mm mesh
[3] 90-126 mm mesh
[4] greater than 152 mm mesh in NAFO Divisions 4VW

Table 2. Number of records in MARFIS, classified by fishery and year, without trip identifiers.

FISHERY	2002	2003	2004	2005	2006
ALE-GN		10	11	8	45
ALE-FPN			5		
GRO-LLS		7	2		
CLM	6395	8588	13602	9504	7355
CLM-HS	21	21	13		12
LBA-FPO	34707	112324	110017	133907	129629
LBA-FPO-OF	1		18	35	4
HER-GN			3	2	
HER-FPN				5	5
HER-FWR			76	69	103
HM-GN	190	63	80	85	223
MAC-GN				2	
MAC-FPN					5
SWO-LL					1
TUN-LL				3	

Table 3. Association of gear codes in the MARFIS and ISDB databases that was used to assist with or confirm trip matches. There is not a one-to-one relationship with multiple ISDB codes corresponding to a single MARFIS code and vice versa.

ISDB		**MARFIS**	
code	*description*	*code*	*description*
7	SHRIMP TRAWL	20	MODIFY SHRIMP MIDWTR
7	SHRIMP TRAWL	19	SHRIMP TRAWL
12	BOTTOM OTTER TRAWL (STERN)	12	OTTER TRAWL, STERN
15	MIDWATER TRAWL (STERN)	15	MIDWATER TRAWL STERN
31	PURSE SEINE	31	PURSE SEINE
50	LONGLINE (TYPE NOT SPECIFIED)	51	LONGLINE
51	SET LINES (BOTTOM OR NEAR BOT.	51	LONGLINE
52	DRIFT LINES (DRIFTING LONGLINE	51	LONGLINE
54	TROLL LINES	60	ANGLING
54	TROLL LINES	54	TENDED LINE
54	TROLL LINES	51	LONGLINE
55	MECHANIZED SQUID JIGGER	52	AUTOMATED JIGGER GROUNDFISH
55	MECHANIZED SQUID JIGGER	53	JIGGER
55	MECHANIZED SQUID JIGGER	55	MECHANICAL JIGGER
60	TRAPS (TYPE NOT SPECIFIED)	63	WEIR
60	TRAPS (TYPE NOT SPECIFIED)	62	TRAP
60	TRAPS (TYPE NOT SPECIFIED)	61	TRAP NET
62	COVERED POTS (LOBSTER,CRAB,ETC)	62	TRAP
71	DREDGE (BOAT)	71	DRAG
81	HARPOONS	85	ELECTRIC HARPOON
81	HARPOONS	81	HARPOON/SPEAR
41	SET GILLNETS	41	GILL NET (SET OR FIXED)
11	BOTTOM OTTER TRAWL (SIDE)	11	OTTER TRAWL, SIDE
9	MIDWATER TRAWL (CHARTERS)	13	MIDWATER TRAWL
9	MIDWATER TRAWL (CHARTERS)	15	MIDWATER TRAWL STERN
9	MIDWATER TRAWL (CHARTERS)	17	MIDWATER TRAWL, PAIR
16	BOTTOM PAIR TRAWL (2 BOATS)	16	OTTER TRAWL, PAIR
17	MIDWATER PAIR	17	MIDWATER TRAWL, PAIR
18	OTTER SHRIMP TRIPLE TRAWL	19	SHRIMP TRAWL
18	OTTER SHRIMP TRIPLE TRAWL	18	SEMI PELAGIC TRAWL
19	OTTER SHRIMP TWIN TRAWL	19	SHRIMP TRAWL
21	DANISH SEINE	21	DANISH SEINE
22	SCOTTISH SEINE	22	SCOTTISH SEINE
23	PAIR SEINE (2 BOATS)	33	PAIR SEINE
13	MIDWATER TRAWL (SD.STERN UNSPE	13	MIDWATER TRAWL
53	HANDLINES (INC.POLELINES,JIG-L	59	HAND LINE
53	HANDLINES (INC.POLELINES,JIG-L	60	ANGLING
53	HANDLINES (INC.POLELINES,JIG-L	54	TENDED LINE

Table 4. Data code definitions for the recorded fields 'condition of fish', 'capture type' and 'release type' in the ISDB database.

	Code	Description
Condition of Fish	0	Unable to determine
	1	Live when landed
	2	Dead when landed
	3	Shark bit
Capture Type	0	Unable to determine
	1	Mouth hooked - Removed
	2	Mouth hooked - Line cut
	3	Gear entangled - Removed
	4	Gear entangled - Line cut
	5	Hook swallowed - Removed
	6	Hook swallowed - Line cut
	7	Flipper/body hooked - Removed
	8	Flipper/body hooked - Line cut
Release Type	0	Unable to determine
	1	Alive - no injury
	2	Alive - injured
	3	Dead
	4	Shark bit
	5	Moribund

Table 5. The number of trips during 2002 to 2006 for which the 'Condition of Fish', 'Capture Type' and 'Release Type' information was recorded in the ISDB database, by area, gear and the species that the fishery was targeting. LL/HL/Troll represents longline/handline/troll lines according to the ISDB gear coding.

			No. of Trips		
Area	**Gear**	**Species Sought**	**Condition of Fish**	**Capture Type**	**Release Type**
4VW	Harpoon	Tunas/Swordfish	1		
	LL/HL/Troll	Porbeagle	17	13	13
		Tunas/Swordfish	59	58	58
4X5Y	Dredge	Sea Scallop	1		117
	Harpoon	Tunas/Swordfish	1		
	LL/HL/Troll	Porbeagle	4	3	3
		Tunas/Swordfish	122	53	44
5Z	Dredge	Sea Scallop			9
	Harpoon	Tunas/Swordfish	1	1	
	LL/HL/Troll	Tunas/Swordfish	16	13	13

Table 6. Number of records with 'Condition of Fish', 'Capture Type' and 'Release Type' recorded in the ISDB database by type of fishery and species for area 4VW. The number in the brackets refers to the number of times that the variable was recorded as zero (unable to determine).

Fishery	Species Sampled	Condition of Fish	Capture Type	Release Type
Tunas/Swordfish Harpoon	Swordfish	3		
Porbeagle Longline/ Handline/ Troll	Barndoor Skate		4	4
	Bigeye Tuna		4	4
	Blue Shark	13	88	88
	Bluefin Tuna		1	1
	Great Black-Backed Gull		2	2
	Longnose Lancetfish		24 (1)	24 (2)
	Monkfish, Goosefish, Angler		2	2 (1)
	Porbeagle, Mackerel Shark	2484 (60)	26 (17)	26 (3)
	Sea Lamprey		3 (3)	3 (1)
	Spiny Dogfish	23	47	47
	Swordfish		2	2
Tunas/ Swordfish Longline/ Handline/ Troll	Albacore Tuna	186 (11)	66	20
	Atlantic Manta		1	1 (1)
	Bigeye Tuna	712 (9)	210	27
	Black Marlin		1	1
	Blue Marlin	16	84 (3)	76 (5)
	Blue Shark	53	5453 (182)	5476 (138)
	Bluefin Tuna	146 (2)	52 8)	50
	Cubiceps capensis		1	1
	Dolphin-fish	272 (1)	51	12
	Dolphins (NS)		1	1
	Escolar		2	2
	Great Black-Backed Gull		27 (1)	27 (1)
	Greater Shearwater		2	2
	Green Sea Turtle		17	18
	Hard Shell Sea Turtle (NS)		5	5
	Herring Gull		2	2
	Kemps Ridley Sea Turtle		2	2
	Leatherback Sea Turtle		28 (2)	29
	Loggerhead Sea Turtle		205 (10)	206 (10)
	Longfin Mako	1	3	2
	Longnose Lancetfish		49 (2)	54 (8)
	Monkfish, Goosefish, Angler	1	5	5
	Northern Gannet	1	44	45
	Ocean Sunfish		11 (1)	11
	Oilfish	1	3	3
	Opah		2	3
	Pelagic Stingray	1	160	162 (5)
	Perch like Fish	1		
	Porbeagle, Mackerel Shark	965 (35)	893 (25)	887 (86)
	Sea Lamprey		1 (1)	1
	Seals (NS)		2	2
	Shark (NS)		1	1
	Shortfin Mako	188 (8)	182 (9)	171 (7)
	Striped Bonito/Skipjack		1	1
	Swordfish	1941 (22)	566 (19)	545 (19)
	Thresher Shark	1 (1)	10 (3)	10 (2)
	Tiger Shark		8	8
	Tortoises and Sea Going turtles		3 (2)	2
	Wahoo	4		
	White Marlin	15	25	25
	Yellowfin Tuna	575	115	7
4VW Total		**7603**	**8497**	**8106**

Table 7. Number of records with 'Condition of Fish', 'Capture Type' and 'Release Type' recorded in the ISDB database by type of fishery and species for area 4X5Y. The number in the brackets refers to the number of times that the variable was recorded as zero (unable to determine).

Fishery	Species Sampled	Condition of Fish	Capture Type	Release Type
Sea Scallop Dredge	American Lobster	104		5067 (92)
	American Plaice			39
	Atlantic Rock Crab			113
	Barndoor Skate			2
	Cod			65
	Haddock			30
	Halibut			3
	Herring			1
	Little Skate			318
	Longhorn Sculpin			159
	Monkfish, Goosefish, Angler			210
	Ocean Pout (Common)			5
	Pollock			1
	Red Hake			18
	Redfish			2
	Rock Gunnel			1
	Sea Raven			65
	Silver Hake			31
	Striped Atlantic Wolffish			3
	Witch Flounder			204
	Yellowtail			341
Tunas/Swordfish Harpoon	Bluefin Tuna	3		
Porbeagle Longline/ Handline/ Troll	Blue Shark		1	1
	Porbeagle, Mackerel Shark	191	2	2
	Spiny Dogfish		32	32
	White Hake		1	1
Tunas/ Swordfish Longline/ Handline/ Troll	Albacore Tuna	1505 (10)	63	38
	Atlantic Manta		1	1
	Barracudina, unidentified		1	1
	Bigeye Tuna	738 (7)	64 (2)	49
	Black Marlin		8	8
	Blackfin Tuna		1	1
	Blue Marlin	5	26	26
	Blue Shark	1	1237 (125)	1237 (43)
	Bluefin Tuna	420 (18)	120 (5)	71
	Cutlessfishes (NS)		7	7
	Dolphin-fish	602 (5)	23	23
	Dolphins (NS)		1	1
	Dusky Shark		2	2
	Escolar		7	7
	Greater Shearwater		4	4
	Green Sea Turtle		4	4
	Leatherback Sea Turtle		22 (1)	22
	Loggerhead Sea Turtle		55	55
	Longnose Lancetfish		41 (3)	41 (5)
	Monkfish, Goosefish, Angler		2	2
	Ocean Sunfish		6	6
	Oceanic Puffer		1	1
	Oilfish		1	1
	Olive Ridley Sea Turtle		1	1
	Pelagic Stingray		227 (1)	227 (1)
	Porbeagle, Mackerel Shark	7	155 (2)	155 (1)
	Remora		2 (2)	2
	Shark (NS)	1		
	Shortfin Mako	146 (3)	120 (1)	120
	Shortnose Lancetfish		1	1
	Striped Bonito/Skipjack		2	2
	Swordfish	674	349 (6)	348 (3)
	Thresher Shark		4	4
	Thunnus sp.		1 (1)	1
	Tiger Shark		6	6
	Tuna/Swordfish		1	1
	White Marlin	6	32	32
	Yellowfin Tuna	334	32 (1)	32
4X Total		4737	2666	9254

Table 8. Number of records with 'Condition of Fish', 'Capture Type' and 'Release Type' recorded in the ISDB database by type of fishery and species for area 5Z. The number in the brackets refers to the number of times that the variable was recorded as zero (unable to determine).

Fishery	Species Sampled	Condition of Fish	Capture Type	Release Type
Sea Scallop Dredge	American Lobster			41
	American Plaice			37
	Cod			1140 (4)
	Conger Eel			1
	Flatfish			3111
	Haddock			1402 (16)
	Halibut			1
	Red Hake			395
	Silver Hake			157
	Unidentified fish and inverts			1
	White Hake			233
	Witch Flounder			146
	Yellowtail			6043 (8)
Tunas/Swordfish Harpoon	Bluefin Tuna	2	2	
Tunas/ Swordfish Longline/ Handline/ Troll	Albacore Tuna	266	4	4
	Atlantic Manta		1	1
	Bigeye Tuna	163	8	8
	Blue Marlin	3	17 (1)	17 (1)
	Blue Shark		369 (16)	369 (4)
	Bluefin Tuna	18	20	20
	Dolphin-fish	322 (4)	1	
	Dolphins (NS)		1	1
	Greater Shearwater		1	1
	Green Sea Turtle		4	4
	Kemps Ridley Sea Turtle		1	1
	Leatherback Sea Turtle		15 (2)	15
	Loggerhead Sea Turtle		103 (3)	103 (3)
	Longfin Mako		2	2
	Longnose Lancetfish		4	4
	Ocean Sunfish		3	3
	Oilfish		2	2
	Pelagic Stingray		136 (2)	136 (2)
	Porbeagle, Mackerel Shark		22	22
	Rays (NS)		1	1
	Sand Shark		1	1
	Shortfin Mako	93 (3)	32 (4)	32 (4)
	Striped Bonito/Skipjack		1	1
	Swordfish	790 (3)	290 (1)	290 (1)
	Thresher Shark	2 (1)	1	1
	Tiger Shark		8	8
	Tuna/Swordfish		1	1
	White Marlin	2	6	6
	Yellowfin Tuna	719	15	15
5Z Total		2380	1072	13777

Table 9. An evaluation of the gaps and adequacy of observer coverage for principal Canadian fisheries operating in NAFO Divisions 4V, 4W, 4X, 5Y and 5Z.

4VW	**4X and5Y**	**5Z**
coverage not needed		
CLM	CLM	
SWO-HAR	SWO-HAR	SWO-HAR
BFT-HAR	BFT-HAR	BFT-HAR
	URC-DIV	
employ periodic checks		
	HER-PS	
HER_GN	HER-GN	
	HER-FWR	
good information exists		
CRQ-FPO		GRO-OTB
		GRO-OTB-OF
improve coverage		
	GRO-OTB	
GRO-LLS	GRO-LLS	GRO-LLS
	GRO-GNS	
	RED-OTB	
HKS-OTB		
	SCA-DR	SCA-DR-OF
LBA-FPO	LBA-FPO	
PAN-OTS		
SWO-LL	SWO-LL	SWO-LL
	BFT-LTL	

Table 10. Summary of important discards in 4VW by species indicating contributing fisheries. Importance was determined on the basis of amount, consistency and reliability of the estimates. For each species, most important amounts are represented by black cells, followed by grey cells and hatched cells. Blank cells signify no contribution by a fishery to discards of that species. Highlighted species designate those which are discarded by regulation, predominantly by the fisheries licensed for that species.

Licensed Species	GRO-LLS	GRO-OTB	GRO-OTB-OF	HKS-OTB	RED-OTB	RED-OTB-OF	SKW-OTB	HER-PS	HM-OTM	SWO-LL	TUN-LL	SHX-LL	PAN-OTS	CRQ-FPO	CRJ-FPO	CUK-DR
snow crab														■		
halibut(atlantic)	▒															
swordfish										■	▒					
Jonah crab															▒	
blue shark										■						
other sharks	■									▒						
herring(atlantic)			▒	■									▒			
winter skate	▒	▒	▒	▒			■						▒			
other flounders													■			

Species of Potential Concern	GRO-LLS	GRO-OTB	GRO-OTB-OF	GRO-OTM-OF	HKS-OTB	RED-OTB	RED-OTB-OFF	SKW-OTB	HER-PS	HM-OTM	SWO-LL	TUN-LL	SHX-LL	PAN-OTS	CRQ-FPO
northern wolffish	▒														
thorny skate	▒	▒				▒		▒							
loggerhead sea turtle											■				
porbeagle											■				
spiny dogfish			▒		▒	▒									
leatherback sea turtle											■				
basking shark					▒										
shortfin mako											▒				

Table 11. Summary of important discards in 4X5Y by species indicating contributing fisheries. Importance was determined on the basis of amount, consistency and reliability of the estimates. For each species, most important amounts are represented by black cells, followed by grey cells and hatched cells. Blank cells signify no contribution by a fishery to discards of that species. Highlighted species designate those which are discarded by regulation, predominantly by the fisheries licensed for that species.

Licensed Species	GRO-GNS	GRO-LLS	GRO-OTB	GRO-OTB-OF	HKS-OTB	RED-OTB	RED-OTB-OF	SCU-OTB	SKW-OTB	HER-PS	SWO-LL	TUN-LL	BFT-LHP	BFT-LTL	SHX-LL	SCA-DR	SCA-DR-OF	LBA-FPO-OF	CRQ-FPO	CUK-DR
herring(atlantic)																				
scallop																				
american lobster																				
Jonah crab																				
snow crab (queen)																				
halibut(atlantic)																				
spiny dogfish																				
sea cucumbers																				
atlantic rock crab																				
sculpin																				
blue shark																				
sea urchins																				
clam																				
other flounders																				

Species of Potential Concern	GRO-GNS	GRO-LLS	GRO-OTB	GRO-OTB-OF	HKS-OTB	RED-OTB	RED-OTB-OF	SCU-OTB	SKW-OTB	HER-PS	SWO-LL	TUN-LL	BFT-LHP	SHX- LL	SCA-DR	SCA-DR-OF	LBA-FPO-OF	CUK-DR
thorny skate																		
barndoor skate																		
winter skate																		
loggerhead sea turtle																		
leatherback sea turtle																		
smooth skate																		
white hake																		
porbeagle																		
shortfin mako																		
cusk																		
basking shark																		

Table 12. Summary of important discards in 5Z by species indicating contributing fisheries. Importance was determined on the basis of amount, consistency and reliability of the estimates. For each species, most important amounts are represented by black cells, followed by grey cells and hatched cells. Blank cells signify no contribution by a fishery to discards of that species. Highlighted species designate those which are discarded by regulation, predominantly by the fisheries licensed for that species.

Licensed Species	GRO-GNS	GRO-LLS	GRO-OTB	GRO-OTB-OF	YEL-OTB	HER-OTM	BFT-LTL	SWO-LL	SCA-DR-OF	LBA-FPO-OF
scallop									■	
american lobster			■	▒	▒				■	■
Jonah crab									▒	■
yellowtail flounder									■	
other flounders			▒						■	
cod(atlantic)									■	
haddock		▒	▒						■	
blue shark		▒						■		

Species of Potential Concern	GRO-GNS	GRO-LLS	GRO-OTB	GRO-OTB-OF	YEL-OTB	SCA-DR-OF	LBA-FPO-OF
winter skate		▒	■	■	▒	■	
thorny skate		■	■	▒	■	■	
barndoor skate		■	■	▒	▒	■	
smooth skate		▒	■	▒		▒	
cusk		▒					▒
basking shark		▒					

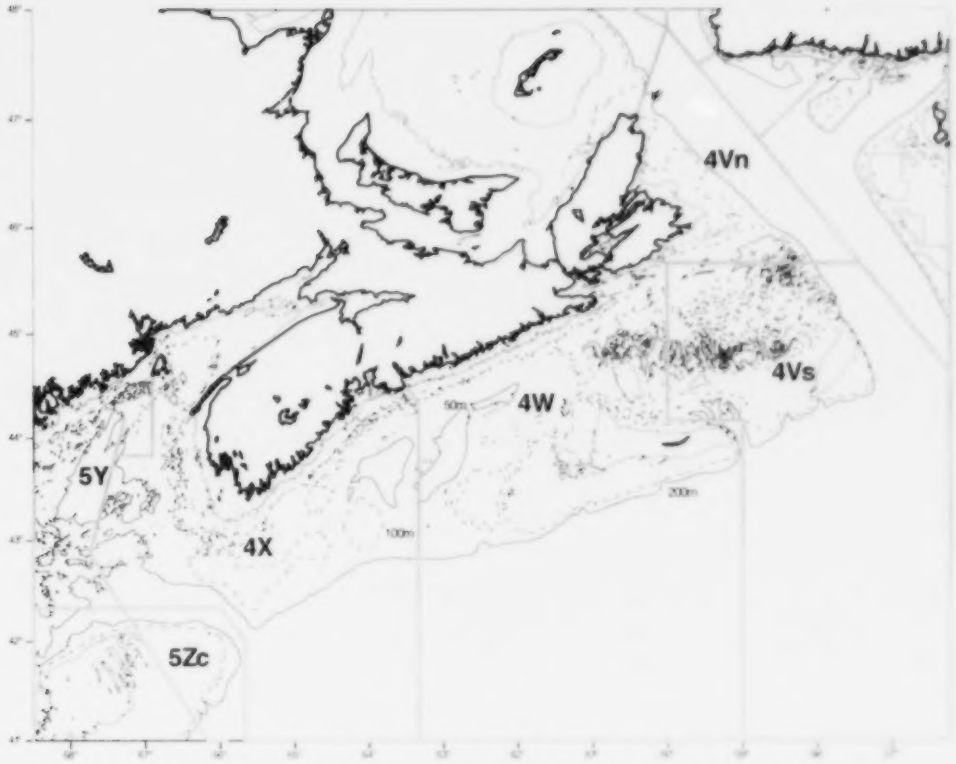

Figure 1. Map of the Maritimes Region showing NAFO Divisions and Subdivisions.

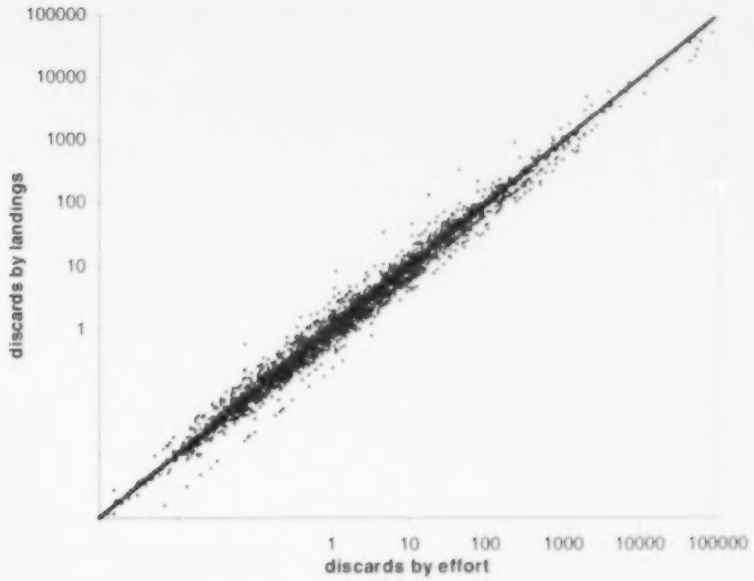

Figure 2. Comparison of discard estimates derived by expanding with landings versus with effort.

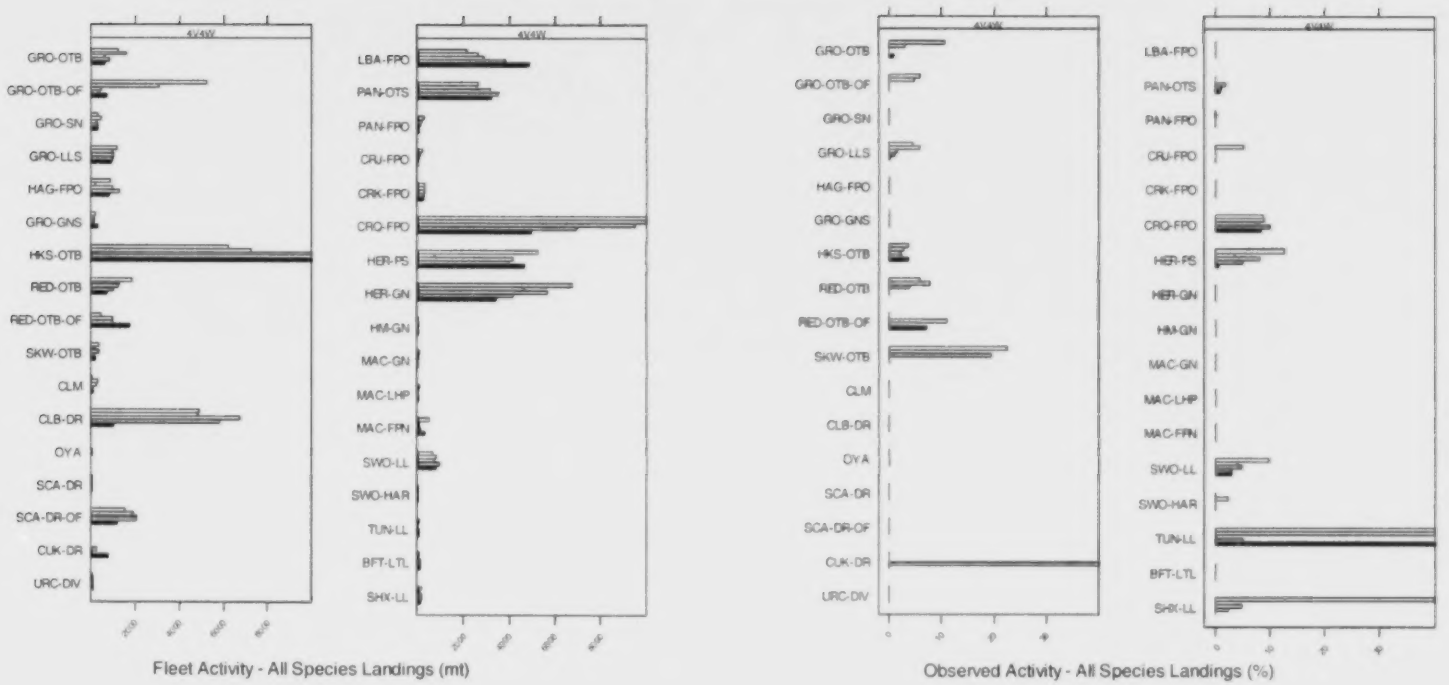

Figure 3. Landings of all species and percent of landings observed for Canadian fisheries (see Table 1 for codes) in NAFO Divisions 4V and 4W. The 5 bars represent years with palest being 2002 and darkest being 2006.

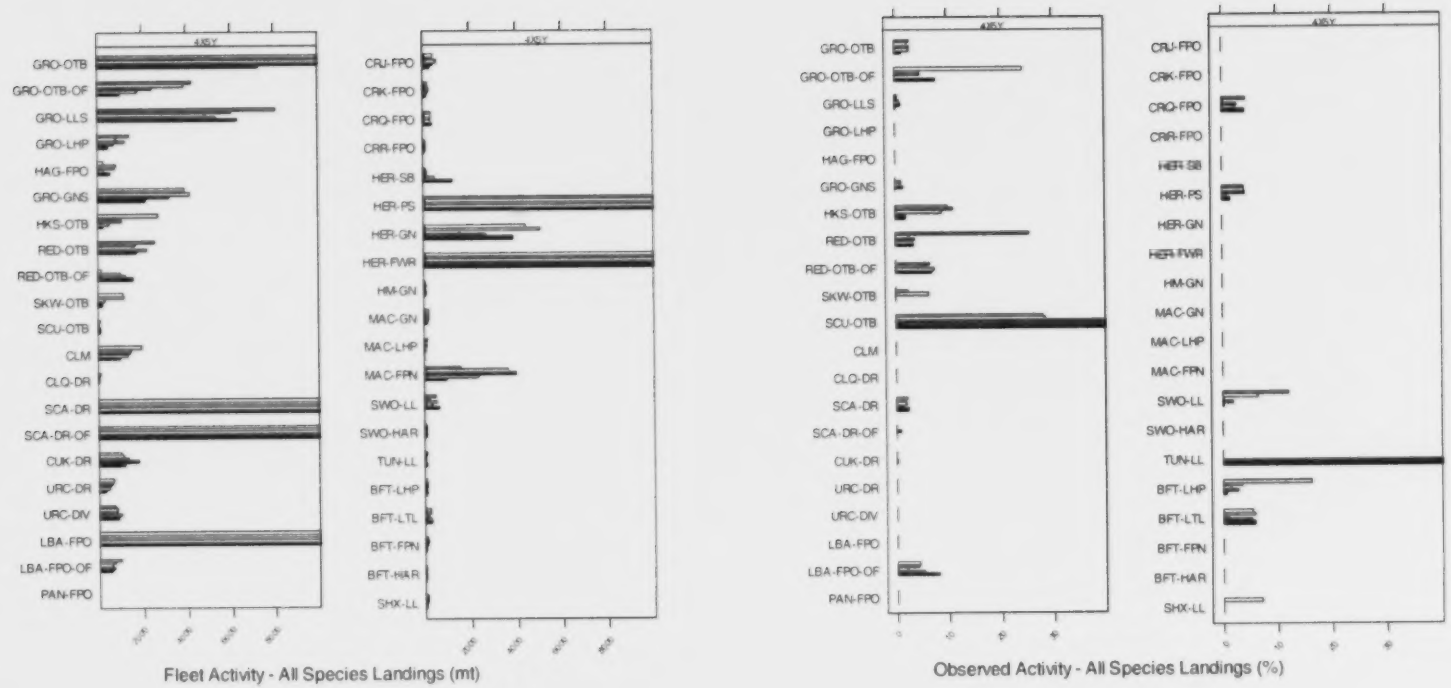

Figure 4. Landings of all species and percent of landings observed for Canadian fisheries (see Table 1 for codes) in NAFO Divisions 4X and 5Y. The 5 bars represent years with palest being 2002 and darkest being 2006.

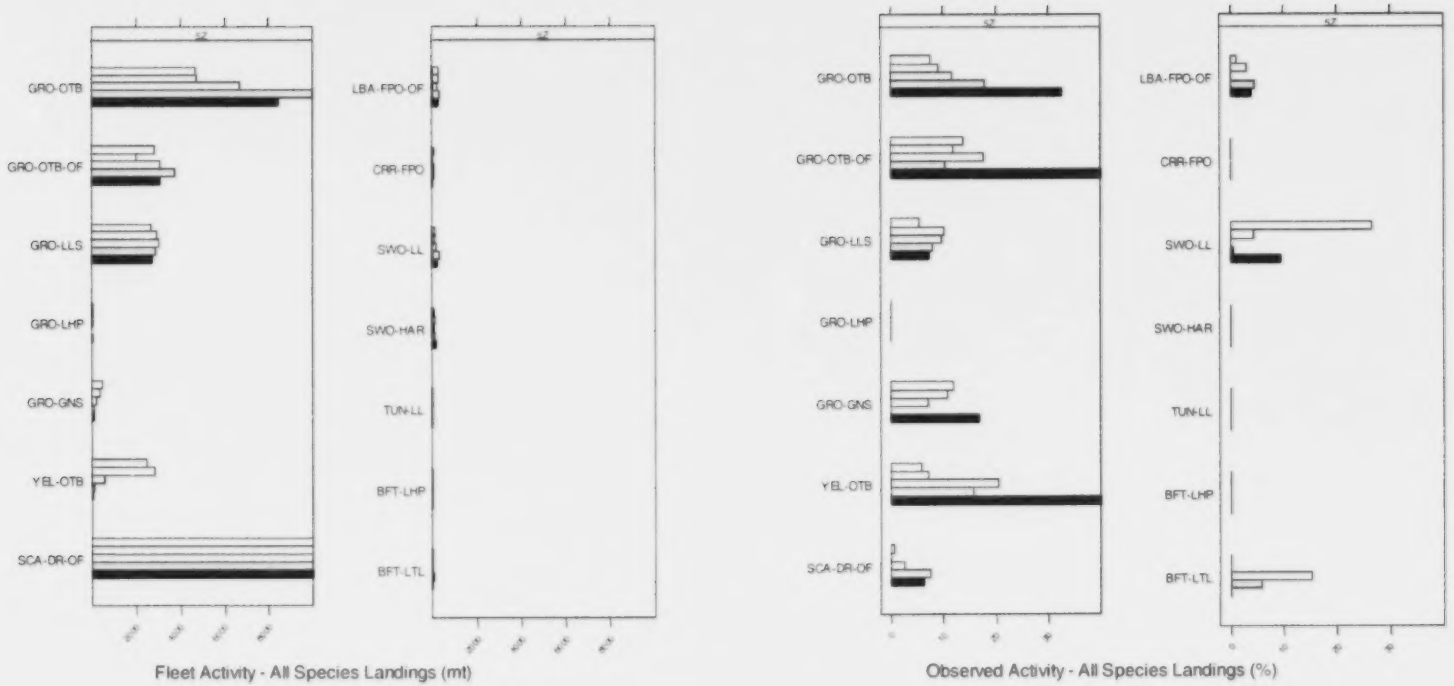

Figure 5. Landings of all species and percent of landings observed for Canadian fisheries (see Table 1 for codes) in NAFO Division 5Z. The 5 bars represent years with palest being 2002 and darkest being 2006.

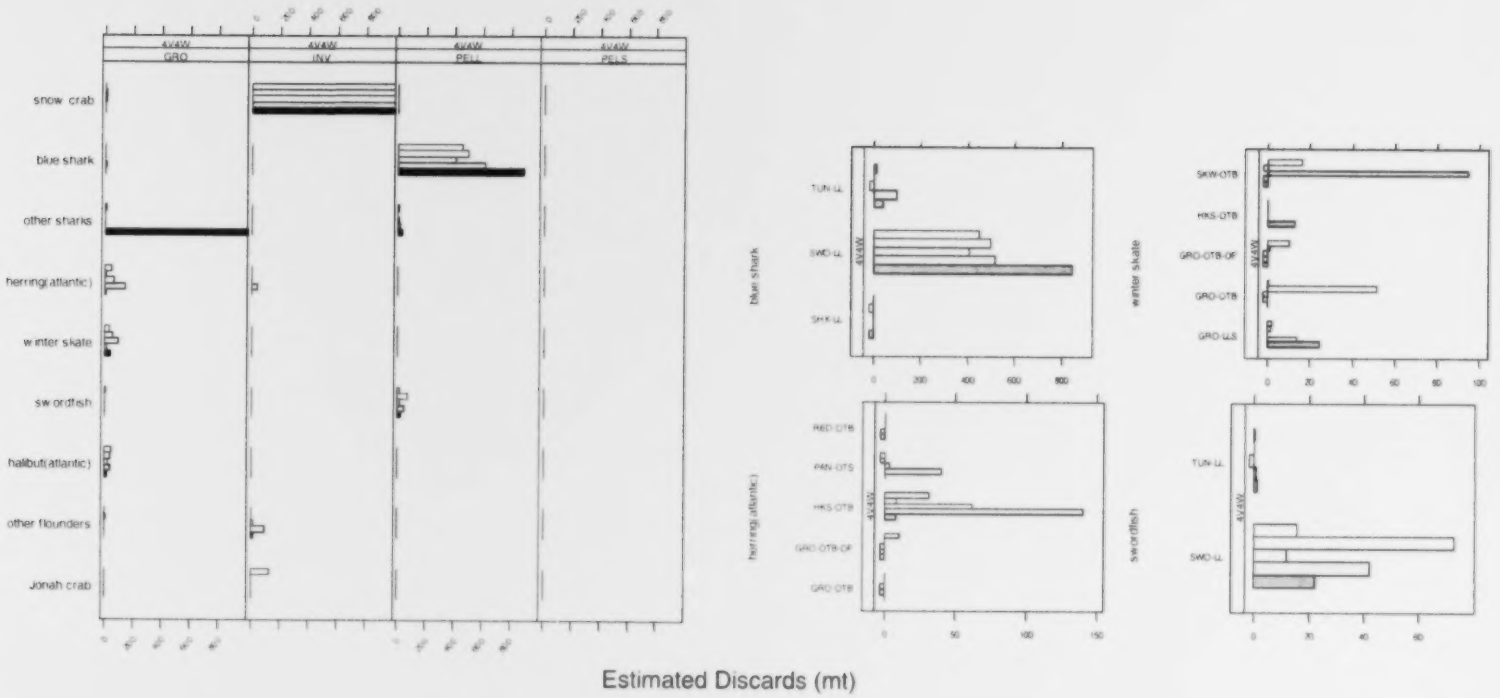

Figure 6. Estimated discards (mt) of licensed species from fisheries (see Table 1 for codes) in 4VW. The 5 bars represent years with palest being 2002 and darkest being 2006. Only species with the highest discards are shown. Bars showing negative discards signify no observer coverage, to distinguish from zero discards when observed. Average landings (mt) from 4VW during 2002-2006 were 0.3 for blue shark, 116 for skate (winter skate not distinguished), 9,971 for herring and 550 for swordfish.

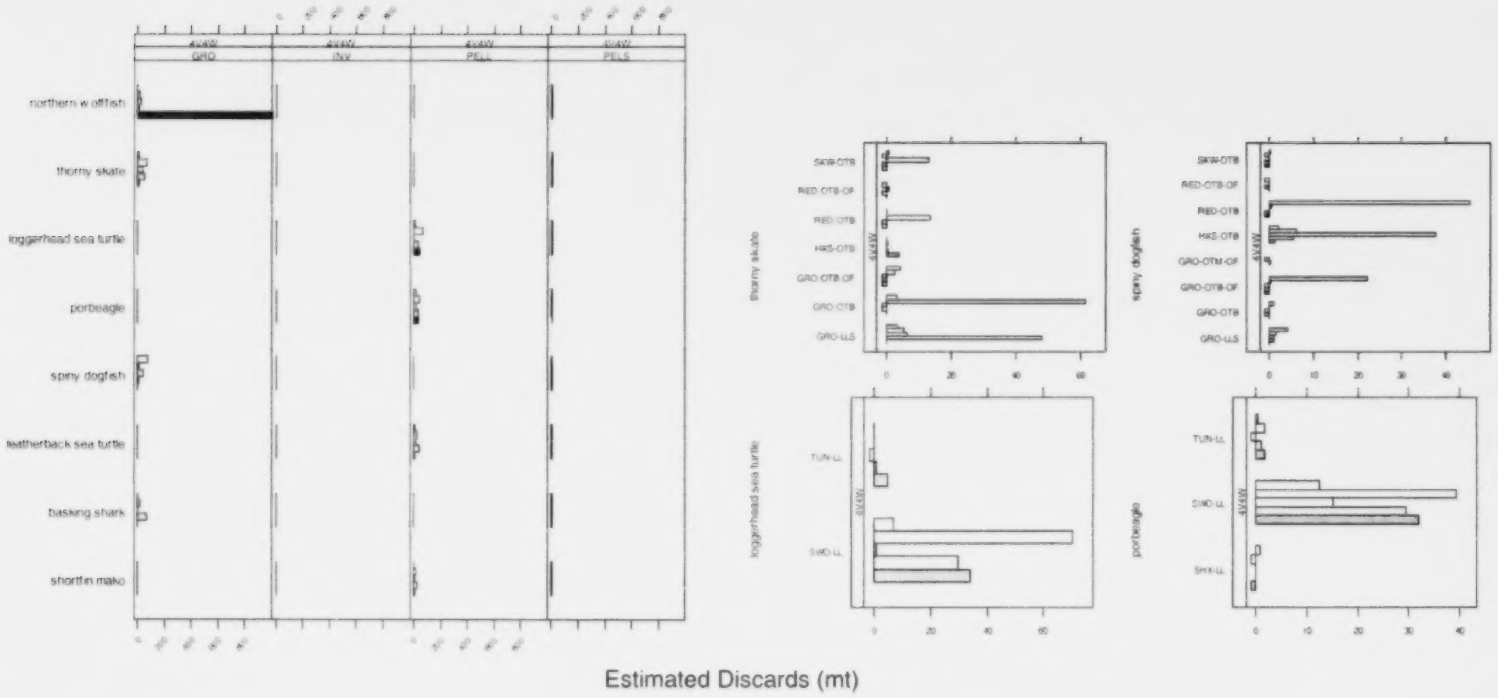

Figure 7. Estimated discards (mt) for species of potential concern from fisheries (see Table 1 for codes) in 4VW. The 5 bars represent years with palest being 2002 and darkest being 2006. Only species with the highest discards are shown. Bars showing negative discards signify no observer coverage, to distinguish from zero discards when observed.

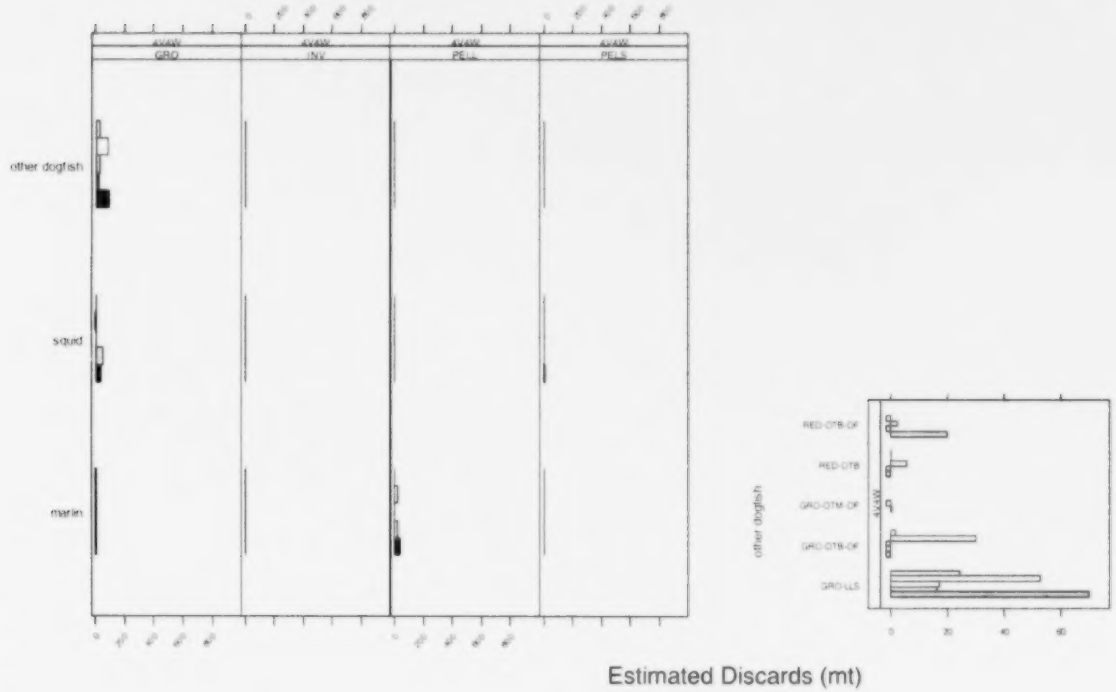

Figure 8. Estimated discards (mt) of other species from fisheries (see Table 1 for codes) in 4VW. The 5 bars represent years with palest being 2002 and darkest being 2006. Only species with the highest discards are shown. Bars showing negative discards signify no observer coverage, to distinguish from zero discards when observed.

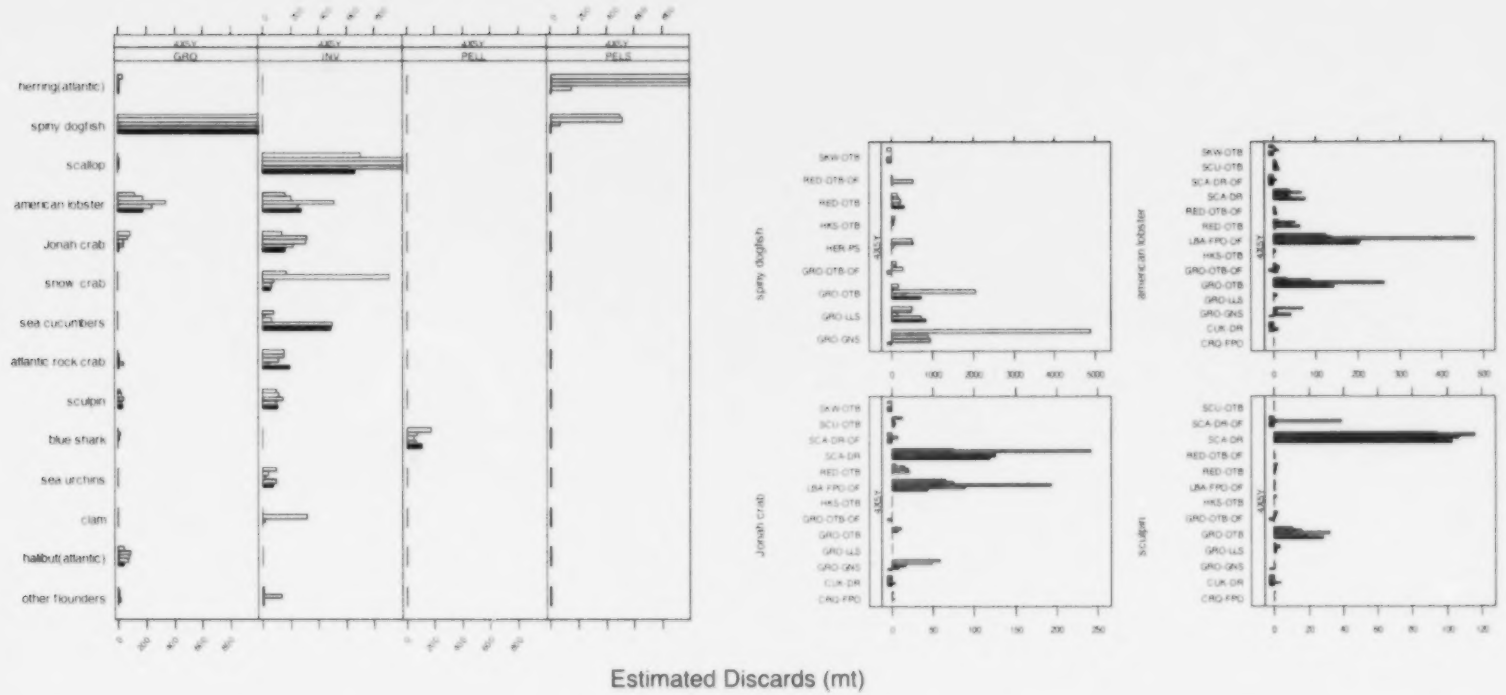

Figure 9. Estimated discards (mt) of licensed species from fisheries (see Table 1 for codes) in 4X5Y. The 5 bars represent years with palest being 2002 and darkest being 2006. Only species with the highest discards are shown. Average landings (mt) from 4X5Y during 2002-2006 were 2,241 for spiny dogfish, 24,582 for lobster, 973 for Jonah crab and 149 for sculpin. Bars showing negative discards signify no observer coverage, to distinguish from zero discards when observed.

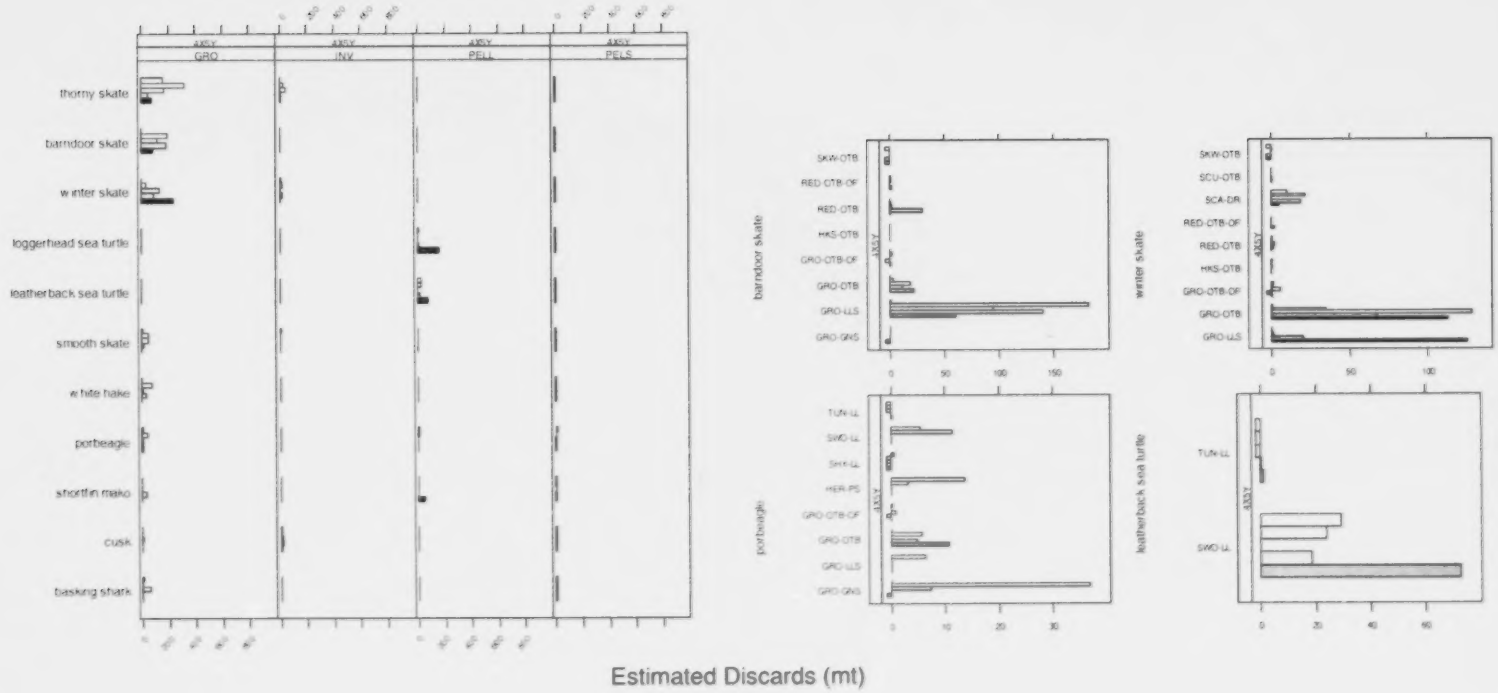

Figure 10. Estimated discards (mt) for species of potential concern from fisheries (see Table 1 for codes) in 4X5Y. The 5 bars represent years with palest being 2002 and darkest being 2006. Only species with the highest discards are shown. Bars showing negative discards signify no observer coverage, to distinguish from zero discards when observed.

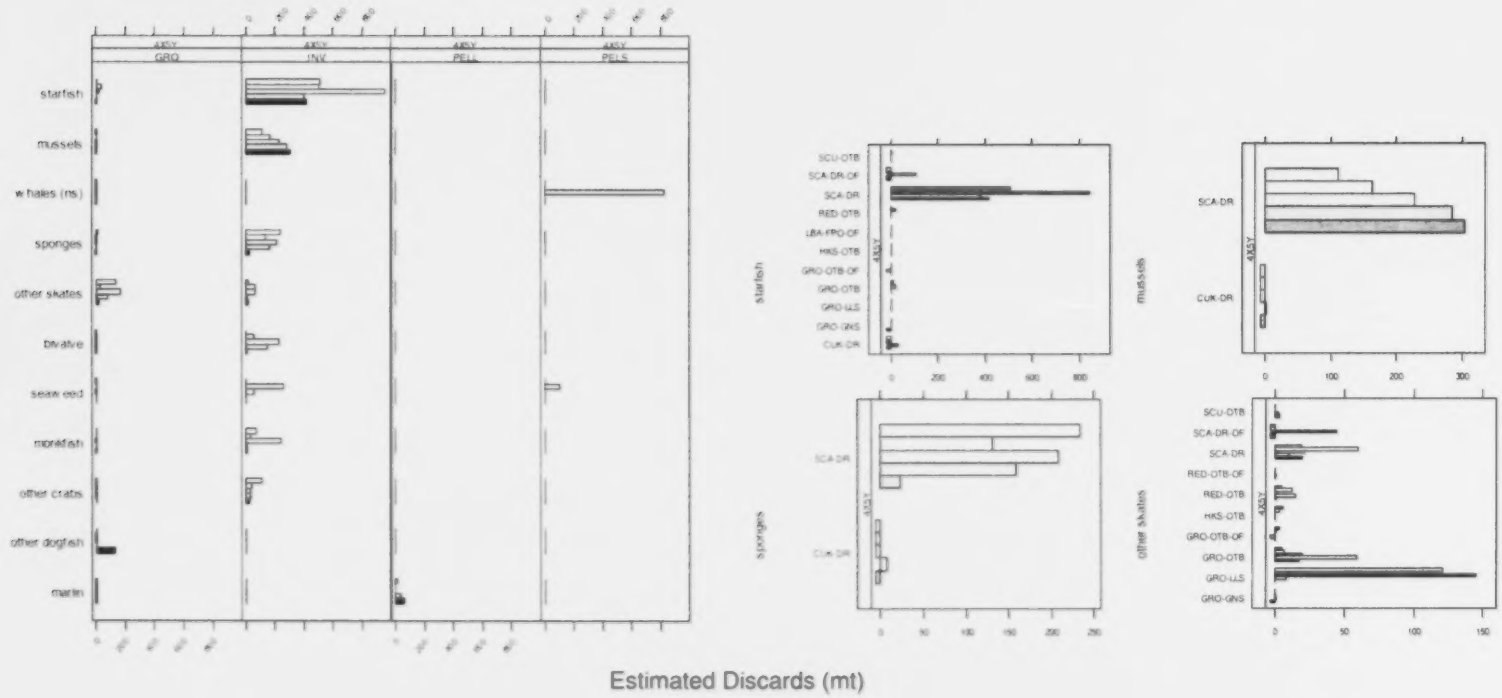

Figure 11. Estimated discards (mt) of other species from fisheries (see Table 1 for codes) in 4X5Y. The 5 bars represent years with palest being 2002 and darkest being 2006. Only species with the highest discards are shown. Bars showing negative discards signify no observer coverage, to distinguish from zero discards when observed.

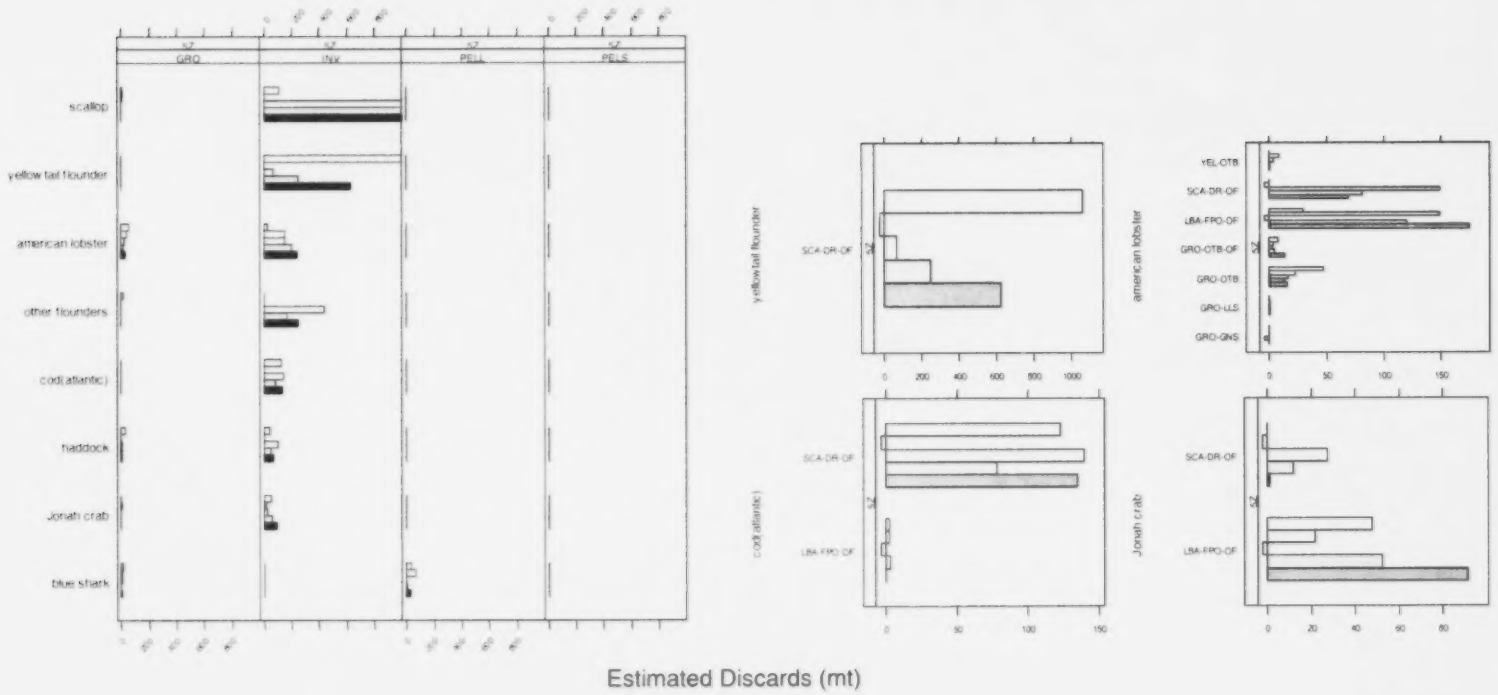

Figure 12. Estimated discards (mt) of licensed species from fisheries (see Table 1 for codes) in 5Z. The 5 bars represent years with palest being 2002 and darkest being 2006. Only species with the highest discards are shown. Average landings (mt) from 5Z during 2002-2006 were 969 for yellowtail flounder, 197 for lobster, 1,087 for cod and 49 for Jonah crab. Bars showing negative discards signify no observer coverage, to distinguish from zero discards when observed.

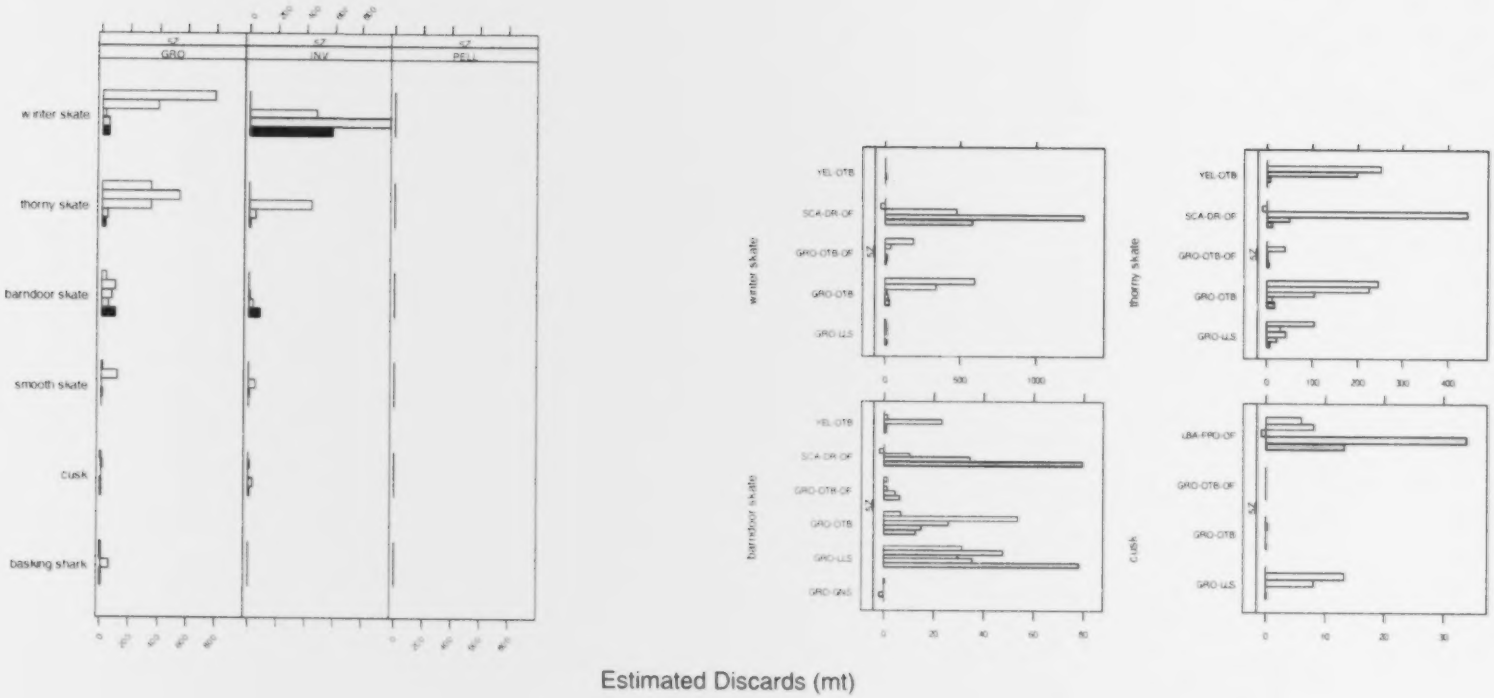

Figure 13. Estimated discards (mt) for species of potential concern from fisheries (see Table 1 for codes) in 5Z. The 5 bars represent years with palest being 2002 and darkest being 2006. Only species with the highest discards are shown. Bars showing negative discards signify no observer coverage, to distinguish from zero discards when observed.

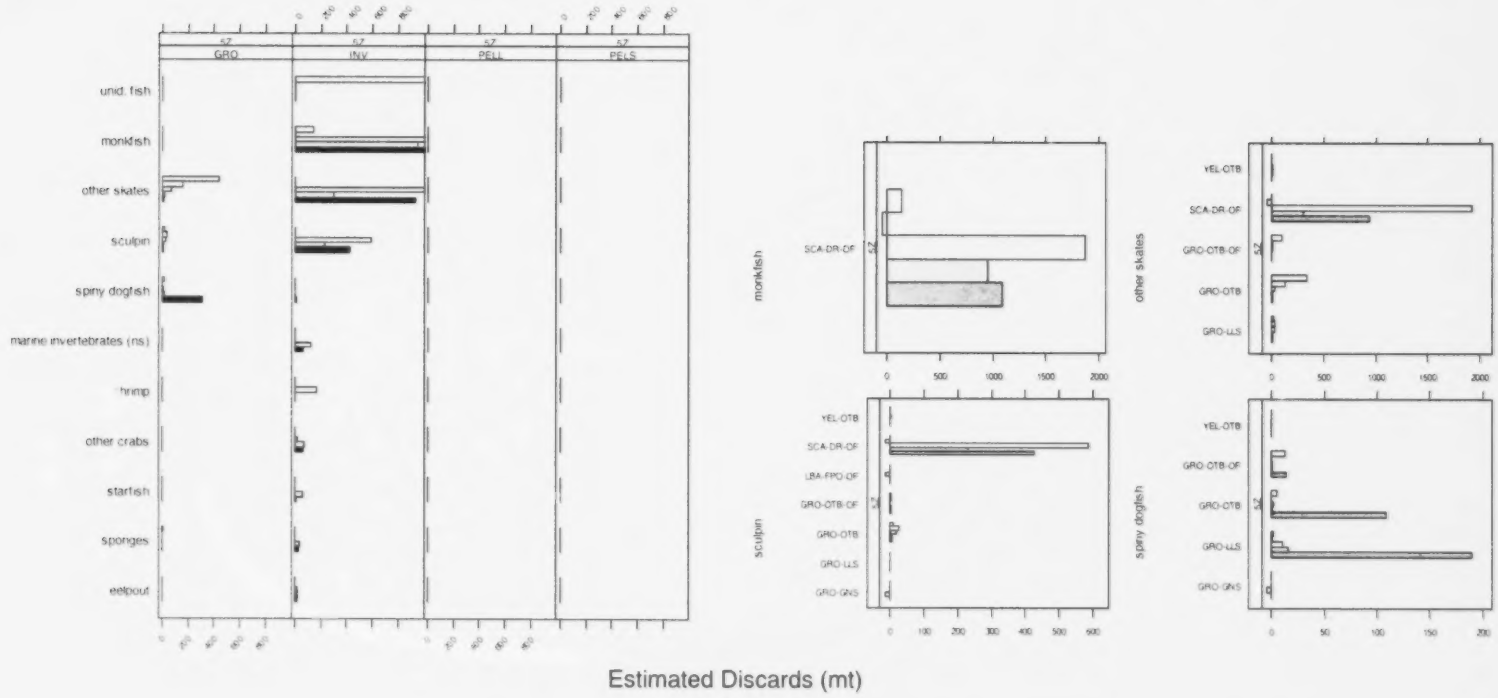

Figure 14. Estimated discards (mt) of other species from fisheries (see Table 1 for codes) in 5Z. The 5 bars represent years with palest being 2002 and darkest being 2006. Only species with the highest discards are shown. Bars showing negative discards signify no observer coverage, to distinguish from zero discards when observed.

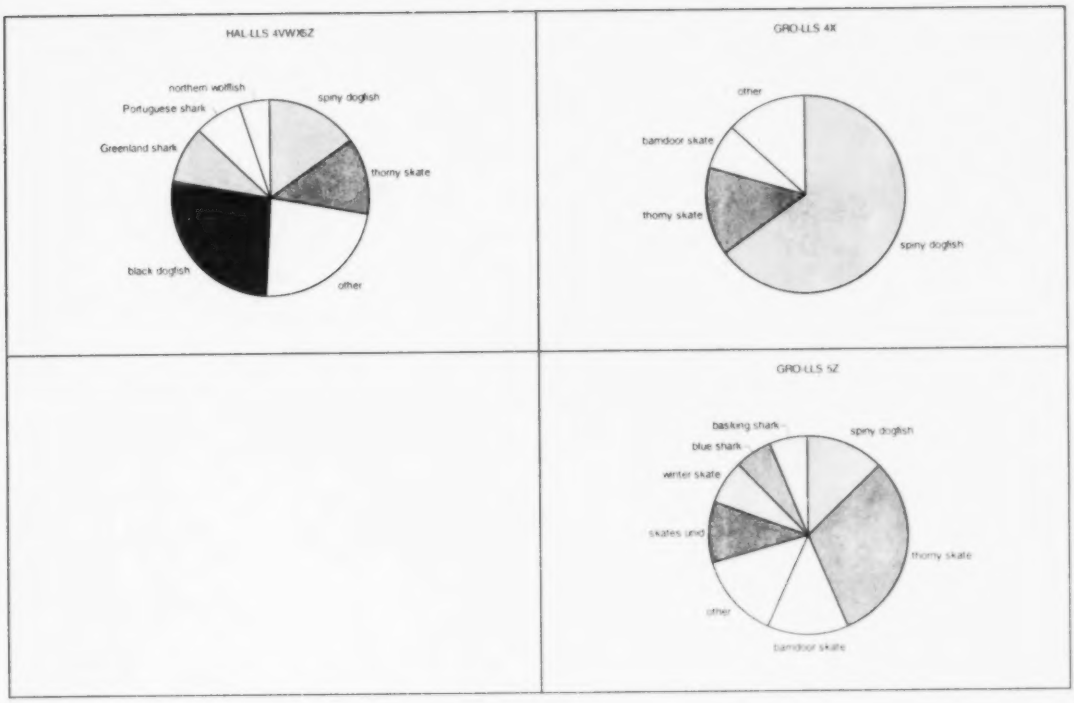

Figure 15. Comparison of the percent species composition of discards for fishing using bottom longline gear when the designated species sought is halibut (left panel) versus groundfish (right panels).

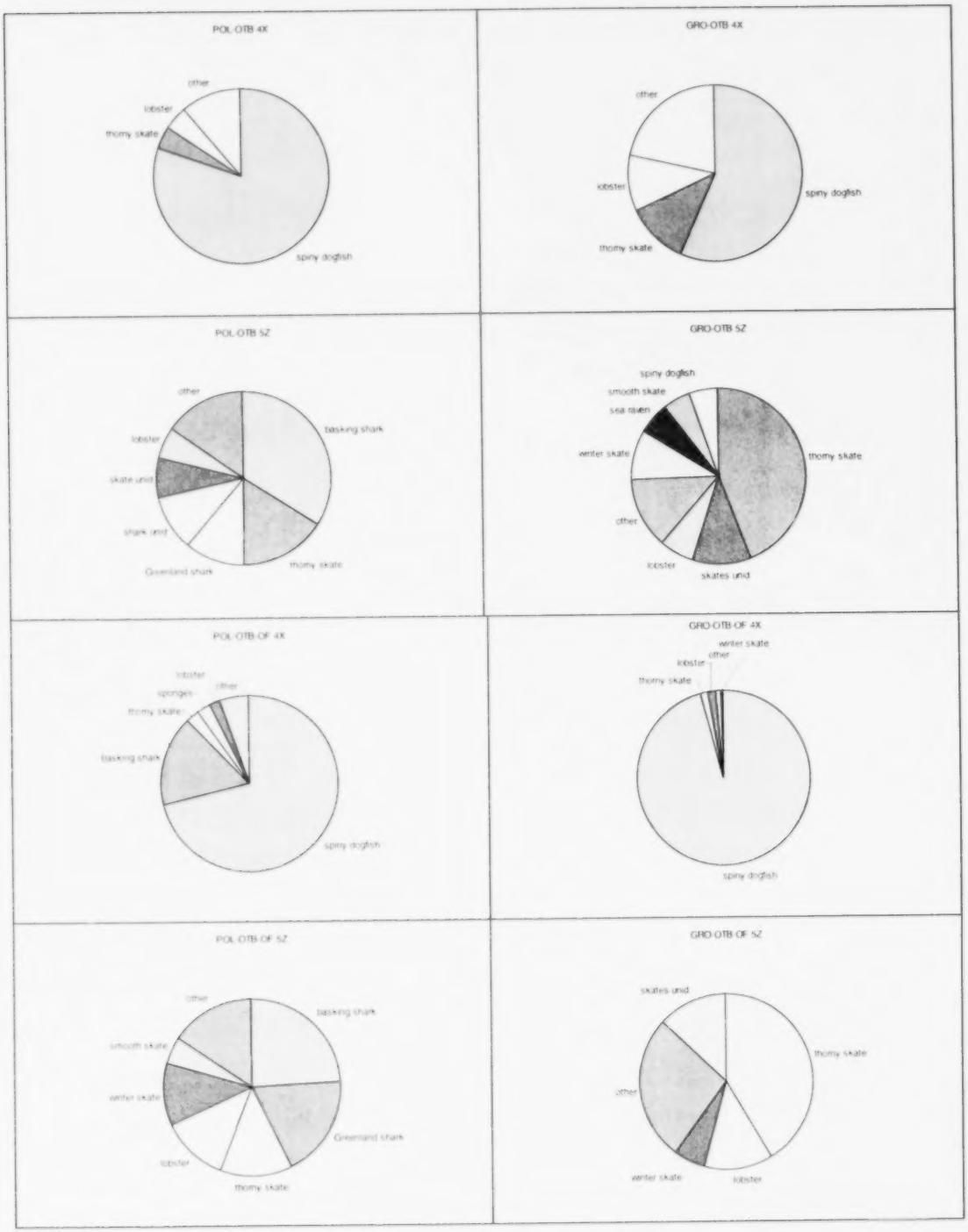

Figure 16. Comparison of the percent species composition of discards for fishing using bottom trawl gear when the designated species sought is Pollock (left panels) versus groundfish (right panels).

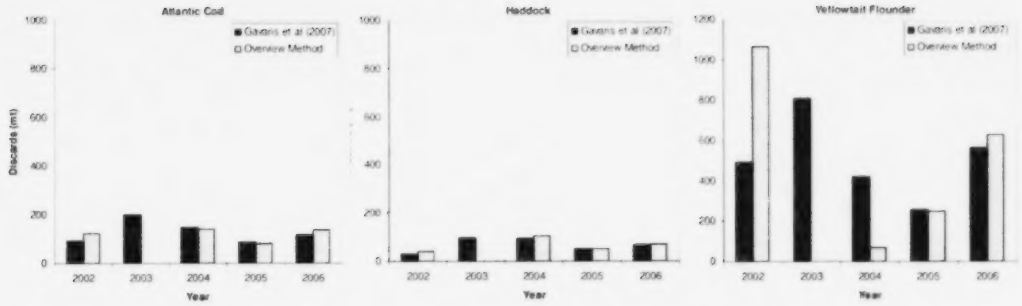

Figure 17. A comparison of the discard estimates (mt) for Atlantic cod, haddock and yellowtail flounder from the 5Z scallop dredge fishery, calculated by Gavaris et al. (2007) shown in black and those calculated using the overview method in this report shown in grey.

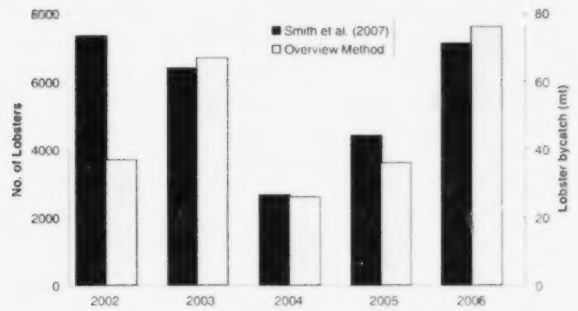

Figure 18. Estimated number of lobsters caught in Scallop Fishing Area 29 by the Full Bay Scallop fleet and the East of Baccaro fleet, 2002 to 2006 (from Tables 10 and 11 in Smith et al. 2007) shown in black and the estimated lobster bycatch by weight (mt) for 4X5Y from the current analysis shown in grey.

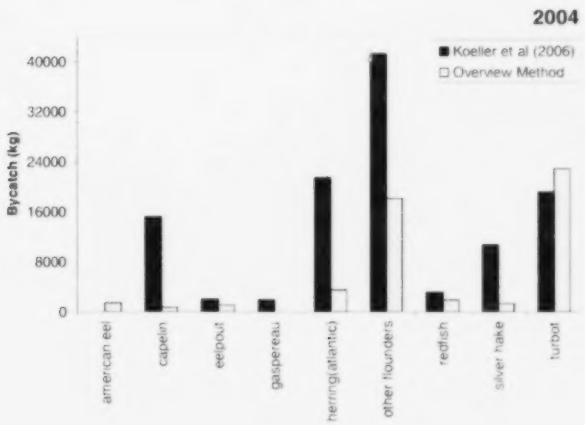

Figure 19. Bycatch estimates (kg) for 2004 by species from the shrimp trawl fishery, extrapolated using shrimp trawl survey data shown in black (Koeller et al. 2006) and from the current overview method analysis shown in grey.

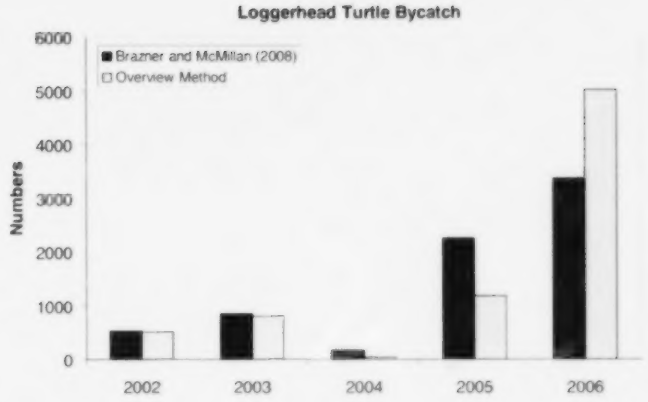

Figure 20. Comparison of the loggerhead turtle bycatch estimates in numbers from the swordfish longline fishery, calculated by Brazner and McMillan (2008) shown in black and the current overview method analysis shown in grey.

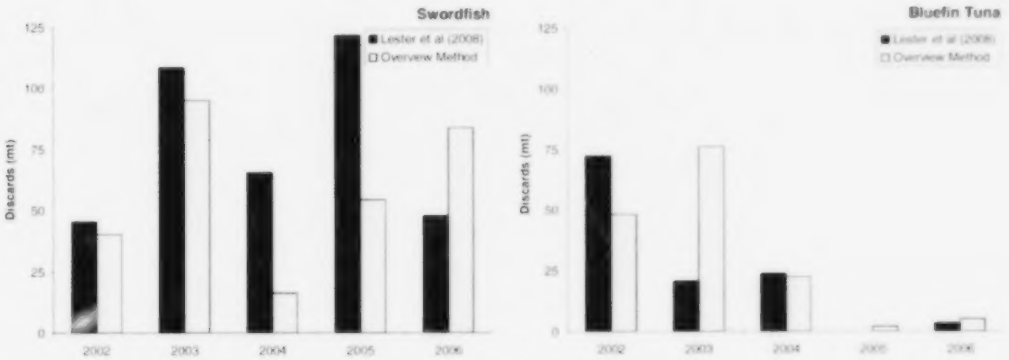

Figure 21. A comparison of the swordfish and bluefin tuna total discard estimates (mt) from the swordfish longline fishery, calculated from Lester et al. (2008) for west of 60°W shown in black and from the current overview method analysis for NAFO areas 4VWX/5YZ shown in grey.

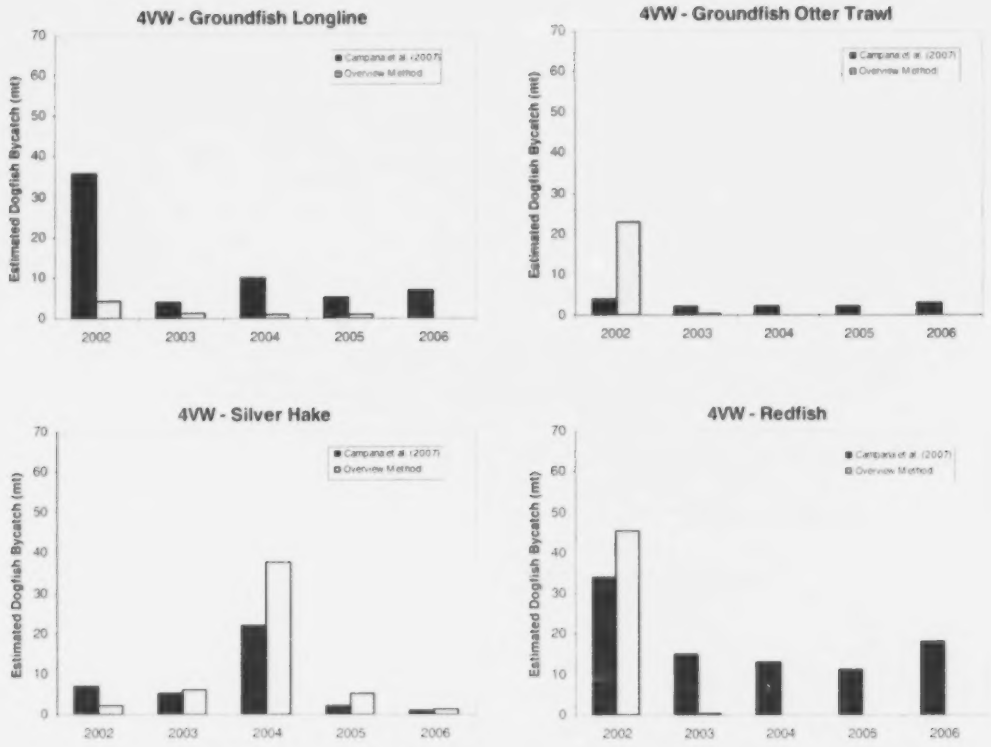

Figure 22. Comparison of the spiny dogfish bycatch estimates by NAFO area and fishery, from Campana et al. (2007) shown in black and the current overview method analysis shown in grey. Note the difference in the vertical axis scale for fisheries in area 4X5Y.

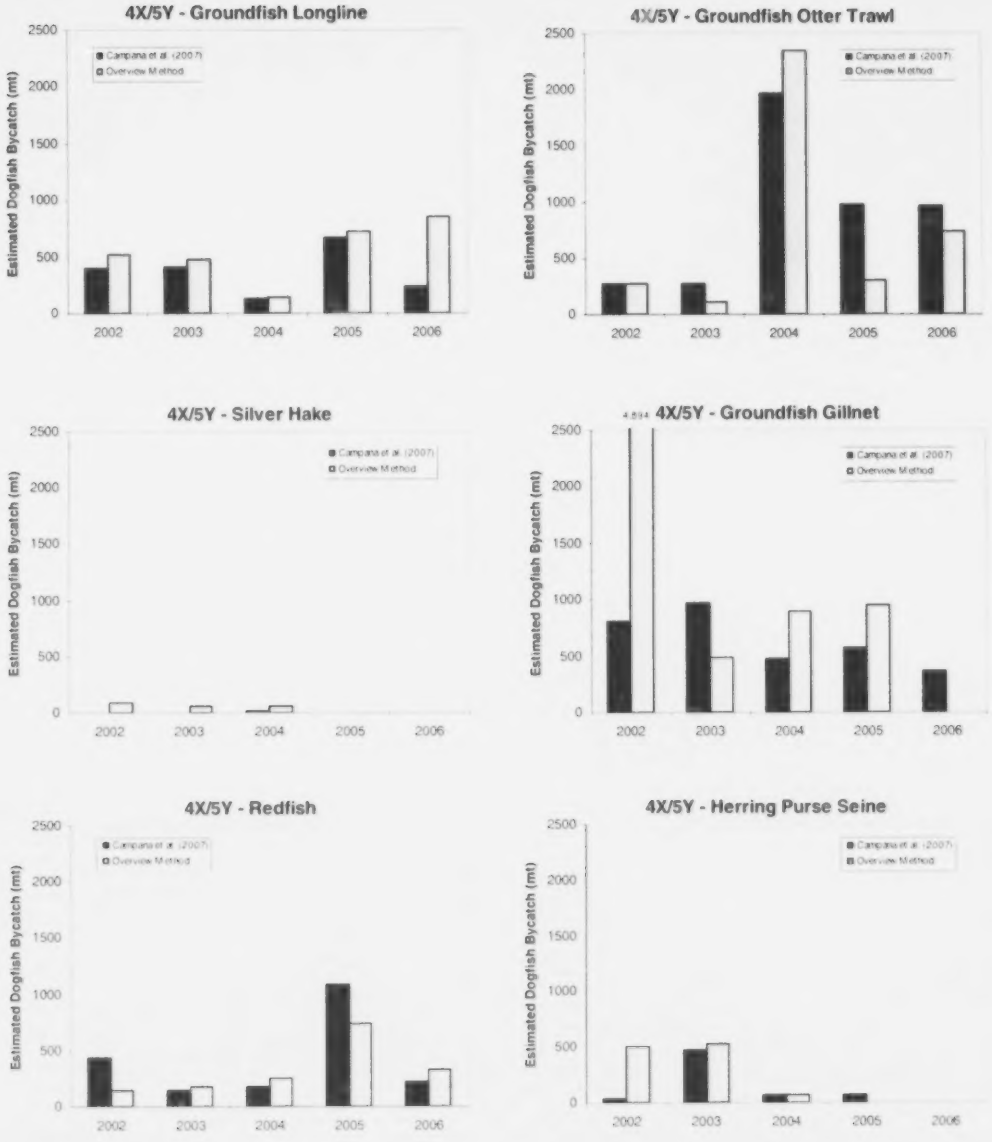

Figure 22. continued

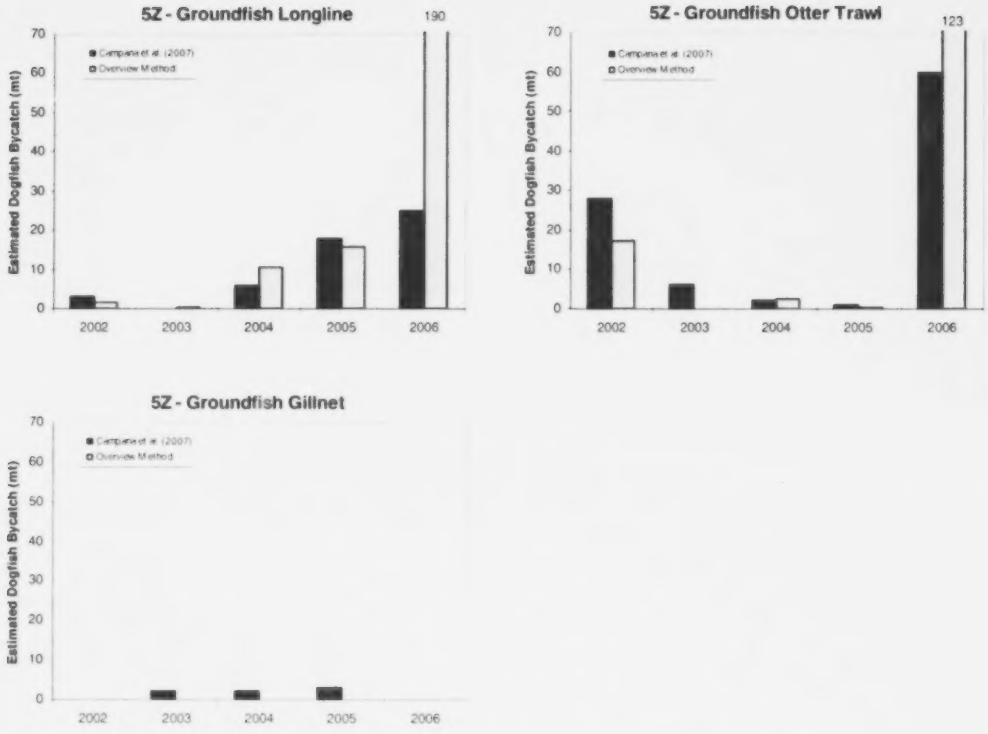

Figure 22. continued

Appendix 1. Observed and total landings (mt) of all species by fishery and year. The percent observer coverage is also indicated.

Fishery	Area	2002	2003	2004	2005	2006
ALE-GN	4V4W		0/0 0%			0/3 0%
	4X5Y			0/0 0%	0/0 0%	0/0 0%
	5Z					
ALE-FPN	4V4W					
	4X5Y			0/4 0%		
	5Z					
GRO-OTB	4V4W	131/1232 11%	49/1577 3%	0/611 0%	0/806 0%	5/605 1%
	4X5Y	353/12006 3%	330/13253 2%	321/11635 3%	321/11328 3%	93/7311 1%
	5Z	355/4705 8%	427/4709 9%	782/6707 12%	1890/10507 18%	2761/8443 33%
GRO-OTB-OF	4V4W	305/5252 6%	144/3057 5%	0/470 0%	0/357 0%	0/720 0%
	4X5Y	1052/4292 25%	174/3901 4%	116/2441 5%	0/1815 0%	82/1033 8%
	5Z	396/2846 14%	236/1993 12%	550/3090 18%	388/3739 10%	1306/3081 42%
GRO-OTM-OF	4V4W			0/67 0%	117/168 70%	
	4X5Y					
	5Z					
GRO-SN	4V4W	0/298 0%	0/469 0%	0/225 0%	0/317 0%	0/302 0%
	4X5Y		0/11 0%	0/13 0%		
	5Z					
GRO-SN-OF	4V4W	0/7 0%	0/21 0%	0/41 0%		
	4X5Y		0/20 0%			
	5Z					
GRO-LLS	4V4W	53/1173 4%	57/992 6%	15/1032 1%	10/965 1%	2/913 0%
	4X5Y	30/8103 0%	32/6073 1%	42/4865 1%	60/5332 1%	21/6312 0%
	5Z	145/2684 5%	300/2949 10%	294/3029 10%	230/2876 8%	198/2719 7%
GRO-LHP	4V4W	0/1 0%	0/0 0%	0/0 0%	0/0 0%	
	4X5Y	0/1420 0%	0/793 0%	0/1239 0%	0/724 0%	0/431 0%
	5Z	0/37 0%	0/24 0%	0/28 0%	0/9 0%	0/25 0%

Fishery	Area	2002	2003	2004	2005	2006
HAG-FPO	4V4W	0/892 0%	0/190 0%	0/980 0%	0/1264 0%	0/805 0%
	4X5Y	0/241 0%	0/832 0%	0/745 0%	0/262 0%	0/533 0%
	5Z					
GRO-FPX	4V4W					
	4X5Y	0/0 0%				
	5Z					
GRO-DR	4V4W					
	4X5Y		0/1 0%			
	5Z					
GRO-GNS	4V4W	0/193 0%	0/147 0%	0/134 0%	0/102 0%	0/290 0%
	4X5Y	1/3906 0%	44/3931 1%	45/4178 1%	52/3237 2%	0/2133 0%
	5Z	51/431 12%	36/335 11%	15/213 7%	0/102 0%	17/102 17%
YEL-OTB	4V4W					
	4X5Y					
	5Z	141/2447 6%	201/2804 7%	118/574 21%	16/99 16%	29/32 91%
HKS-OTB	4V4W	227/6233 4%	208/7237 3%	264/12186 2%	262/10677 2%	436/11897 4%
	4X5Y	275/2735 10%	89/804 11%	98/1088 9%	10/496 2%	5/251 2%
	5Z					
RED-OTB	4V4W	108/1851 6%	100/1273 8%	47/1219 4%	0/1032 0%	0/690 0%
	4X5Y	654/2573 25%	46/1695 3%	59/1585 4%	71/2182 3%	61/1729 4%
	5Z			0/1/0		0/1/0
RED-OTB-OF	4V4W		0/435 0%	109/994 11%	0/944 0%	127/1763 7%
	4X5Y		10/158 7%	53/1008 5%	91/1230 7%	109/1574 7%
	5Z					
SKW-OTB	4V4W	74/327 23%	0/139 0%	64/327 19%	0/131 0%	0/199 0%
	4X5Y	0/1138 0%	29/1154 2%	20/308 6%	0/176 0%	0/207 0%
	5Z					
SCU-OTB	4V4W					
	4X5Y	20/72 28%	15/54 29%	24/46 52%	40/84 47%	71/97 74%
	5Z					
CLM	4V4W	0/45 0%	0/284 0%	0/232 0%	0/115 0%	0/80 0%
	4X5Y	0/1958 0%	0/1510 0%	0/1453 0%	0/1315 0%	0/948 0%
	5Z					

Fishery	Area	2002	2003	2004	2005	2006
CLQ-DR	4V4W		0/0 0%			
	4X5Y	0/99 0%	0/34 0%	0/41 0%	0/43 0%	0/1 0%
	5Z					
CLB-DR	4V4W	0/4911 0%	0/4847 0%	0/6724 0%	0/5806 0%	0/1045% 0
	4X5Y					
	5Z					
OYA	4V4W			0/21 0%	0/28 0%	0/14 0%
	4X5Y					
	5Z					
SCA-DR	4V4W	0/25 0%	0/44 0%	0/56 0%	0/33 0%	0/41 0%
	4X5Y	515/23002 2%	269/23917 1%	411/20071 2%	167/13998 1%	270/11167 2%
	5Z					
SCA-DR-OF	4V4W	0/1561 0%	0/1899 0%	0/2039 0%	0/2058 0%	0/1164 0%
	4X5Y	0/12811 0%	0/12452 0%	215/21546 1%	0/10836 0%	0/12678 0%
	5Z	407/55558 1%	0/51873 0%	833/31321 3%	1736/22610 8%	2142/34265 6%
WHX	4V4W					
	4X5Y	0/1 0%				
	5Z					
CUK-DR	4V4W			0/252 0%	15/23 66%	0/753 0%
	4X5Y	0/1035 0%	0/1108 0%	0/1311 0%	5/1782 0%	0/1157 0%
	5Z					
URC-DR	4V4W					
	4X5Y	0/660 0%	0/630 0%	0/483 0%	0/466 0%	0/307 0%
	5Z					
URC-DIV	4V4W	0/65 0%	0/114 0%	0/90 0%	0/97 0%	0/100 0%
	4X5Y	0/727 0%	0/794 0%	0/809 0%	0/1033 0%	0/877 0%
	5Z					
LBA-FPO	4V4W	0/2148 0%	0/2605 0%	0/2878 0%	0/3834 0%	0/4878 0%
	4X5Y	0/24162 0%	0/24295 0%	0/22196 0%	0/25510 0%	0/26169 0%
	5Z					
LBA-FPO-OF	4V4W	0/5 0%				0/0 0%
	4X5Y	43/974 4%	30/737 4%	11/558 2%	33/650 5%	45/561 8%
	5Z	3/267 1%	7/233 3%	0/195 0%	13/293 5%	9/243 4%

Fishery	Area	2002	2003	2004	2005	2006
CRS-FPO	4V4W	0/9 0%	0/4 0%	0/17 0%	0/3 0%	0/3 0%
	4X5Y					
	5Z					
PAN-OTS	4V4W	0/2645 0%	0/2589 0%	59/3161 2%	34/3497 1%	23/3236 1%
	4X5Y	0/1 0%	0/0 0%			
	5Z					
PAN-FPO	4V4W	0/245 0%	0/157 0%	0/99 0%	0/9 0%	0/32 0%
	4X5Y	0/8 0%	0/6 0%	0/2 0%	0/2 0%	0/5 0%
	5Z					
CRJ-FPO	4V4W	11/207 5%	0/81 0%	0/53 0%	0/9 0%	0/15 0%
	4X5Y	0/392 0%	0/259 0%	0/535 0%	0/374 0%	0/257 0%
	5Z					
CRJ-FPO-OF	4V4W	0/14 0%				
	4X5Y	0/9 0%	0/10 0%			
	5Z					
CRK-FPO	4V4W	0/286 0%	0/272 0%	0/292 0%	0/235 0%	0/236 0%
	4X5Y	0/139 0%	0/134 0%	0/177 0%	0/166 0%	0/93 0%
	5Z					
CRQ-FPO	4V4W	915/10509 9%	919/10391 9%	743/9508 8%	687/6968 10%	415/4972 8%
	4X5Y	13/299 4%	0/309 0%	7/259 3%	7/318 2%	15/359 4%
	5Z					
CRR-FPO	4V4W		0/22 0%			
	4X5Y	0/30 0%	0/38 0%	0/23 0%	0/23 0%	0/9 0%
	5Z	0/37 0%	0/16 0%	0/29 0%	0/25 0%	0/18 0%
KCT-FPO	4V4W			0/0 0%	0/0 0%	
	4X5Y					
	5Z					
CLM-HS	4V4W					
	4X5Y	0/3 0%	0/2 0%	0/2 0%		0/3 0%
	5Z					
JR-FPO	4V4W		0/1 0%			
	4X5Y	0/232 0%	0/236 0%	0/19 0%		
	5Z					

Fishery	Area	2002	2003	2004	2005	2006
M-GH-GN	4V4W					
	4X5Y			0/2 0%	0/3 0%	0/8 0%
	5Z					
M-GS	4V4W			0/3 0%	0/10 0%	0/6 0%
	4X5Y				0/4 0%	0/1 0%
	5Z		0/15 0%	0/4 0%	0/47 0%	13/13 100%
M-HHM	4V4W					401/401 100%
	4X5Y					
	5Z					
M-SL	4V4W					
	4X5Y			0/1 0%	0/2 0%	0/1 0%
	5Z			0/0 0%	0/0 0%	0/0 0%
M-ST1	4V4W			0/6 0%	0/7 0%	
	4X5Y			0/10 0%	0/4 0%	
	5Z			0/5 0%	0/9 0%	
M-ST2	4V4W		0/25 0%	12/18 66%		0/11 0%
	4X5Y	0/1 0%	0/2 0%	0/31 0%		0/1 0%
	5Z					0/1 0%
M-ST3	4V4W					
	4X5Y				0/3 0%	
	5Z					
HER-OTM	4V4W	0/37 0%	0/52 0%	0/20 0%		
	4X5Y					
	5Z	791/1605 49%	235/1749 13%	0/16 0%		
HER-SB	4V4W					
	4X5Y	0/67 0%	0/106 0%	0/101 0%	0/425 0%	0/1222 0%
	5Z					
HER-PS	4V4W	666/5275 13%	26/722 4%	335/4148 8%	191/3924 5%	30/4656 1%
	4X5Y	3121/79623 4%	3379/85879 4%	3066/72538 4%	298/44656 1%	638/46996 1%
	5Z					

Fishery	Area	2002	2003	2004	2005	2006
HER-GN	4V4W	0/6741 0%	0/4588 0%	0/5638 0%	0/4188 0%	0/3419 0%
	4X5Y	0/4432 0%	0/5048 0%	0/1551 0%	0/2696 0%	0/3865 0%
	5Z					
HER-LHP	4V4W					
	4X5Y	0/1 0%				
	5Z					
HER-FPN	4V4W		0/51 0%		0/27 0%	0/28 0%
	4X5Y	0/5 0%		0/44 0%	0/91 0%	
	5Z					
HER-FWR	4V4W					
	4X5Y	0/13373 0%	0/10790 0%	0/25264 0%	0/14892 0%	0/14187 0%
	5Z					
HM-OTM	4V4W				830/830 100%	2565/4292 60%
	4X5Y					
	5Z					
HM-GN	4V4W	0/15 0%	0/8 0%	0/3 0%	0/5 0%	0/13 0%
	4X5Y	0/0 0%	0/49 0%	0/17 0%	0/63 0%	0/22 0%
	5Z					
HM-LHP	4V4W					
	4X5Y		0/0 0%			
	5Z					
HM-FWR	4V4W		0/0 0%			
	4X5Y					
	5Z					
HM-PS	4V4W					0/304 0%
	4X5Y					
	5Z					
MAC-GN	4V4W	0/39 0%	0/11 0%	0/14 0%	0/18 0%	0/15 0%
	4X5Y	0/134 0%	0/122 0%	0/170 0%	0/143 0%	0/80 0%
	5Z					
MAC-LHP	4V4W	0/30 0%	0/15 0%	0/10 0%	0/17 0%	0/15 0%
	4X5Y	0/85 0%	0/11 0%	0/28 0%	0/10 0%	0/17 0%
	5Z					

Fishery	Area	2002	2003	2004	2005	2006
MAC-FPN	4V4W	0/479 0%	0/59 0%	0/44 0%	0/119 0%	0/281 0%
	4X5Y	0/1518 0%	0/3609 0%	0/3980 0%	0/2342 0%	0/957 0%
	5Z					
MAC-FWR	4V4W					
	4X5Y	0/46 0%	0/53 0%	0/2 0%		
	5Z					
SWO-LL	4V4W	63/641 10%	31/794 4%	32/671 5%	26/921 3%	23/775 3%
	4X5Y	52/429 12%	9/135 6%	1/488 0%	6/299 2%	1/570 0%
	5Z	22/82 27%	5/107 4%	0/129 0%	1/303 0%	18/191 10%
SWO-LHP	4V4W			0/0 0%		
	4X5Y		0/2 0%			
	5Z					
SWO-LTL	4V4W			0/0 0%	0/1 0%	
	4X5Y	5/17 29%	3/19 17%			
	5Z	0/0 100%				
SWO-HAR	4V4W	0/2 0%	0/20 2%	0/3 0%	0/20 0%	0/7 0%
	4X5Y	0/9 0%	0/35 0%	0/17 0%	0/51 0%	0/51 0%
	5Z	0/27 0%	0/94 0%	0/65 0%	0/110 0%	0/143 0%
TUN-LL	4V4W	31/31 100%	9/12 69%	0/4 0%	2/46 5%	37/43 86%
	4X5Y	0/28 0%	0/2 0%	0/15 0%	7/7 100%	13/22 58%
	5Z	0/7 0%				
BFT-LHP	4V4W	0/0 0%	0/0 0%	0/6 0%	0/1 0%	0/1 0%
	4X5Y	6/40 16%	1/42 3%	1/47 1%	0/10 3%	0/27 1%
	5Z	0/2 0%	0/2 0%	0/5 0%	0/3 0%	0/3 0%
BFT-LTL	4V4W	0/56 0%	0/10 0%	0/75 0%	0/80 0%	0/101 0%
	4X5Y	10/185 5%	11/191 6%	1/107 1%	9/176 5%	14/237 6%
	5Z	0/3 0%	0/3 0%	0/2 15%	1/24 6%	0/11 0%

Fishery	Area	2002	2003	2004	2005	2006
BFT-FPN	4V4W					
	4X5Y	0/28 0%	0/83 0%	0/34 0%	0/8 0%	0/3 0%
	5Z					
BFT-HAR	4V4W				0/5/0	0/12/0
	4X5Y	0/14 0%	0/10 0%	0/7 0%	0/2 0%	0/4 0%
	5Z				0/5 0%	¼ 12%
PEL-LHP	4V4W					
	4X5Y	0/2 0%				
	5Z					
SHX-LL	4V4W	86/125 69%	0/28 0%	6/125 5%	4/158 2%	0/112 0%
	4X5Y	2/26 7%	0/60 0%	0/51 0%	0/9 0%	0/14 0%
	5Z	0/0 0%				

Appendix 2. Discards (kg) for area, fishery and year by discarded species to support the broad comparisons made in this analysis. Particular estimates should not be construed as definitive or accepted uncritically.

4VW Species	Fishery	2002	2003	2004	2005	2006
alewife	GRO-OTB		19088			
	GRO-OTB-OF	4015				
	HKS-OTB		418	28290	285	11213
	HM-OTM					4183
	PAN-OTS			38	101	140
alligatorfish	PAN-OTS				203	
american eel	PAN-OTS			1384		280
american lobster	CRJ-FPO	20369				
	CRQ-FPO	264	339	384		
	GRO-OTB	19				9183
	GRO-OTB-OF	138				
	HKS-OTB	55				2756
	RED-OTB	205				
	SKW-OTB			62		
argentine	GRO-OTB-OF	793				
	HKS-OTB		35			
	RED-OTB-OF					1415
atlantic rock crab	CUK-DR				47	
	HKS-OTB	27				109
atlantic saury	PAN-OTS			114		
atlantic sea poacher	PAN-OTS				3954	419
barndoor skate	GRO-LLS	178	139	2097	2548	13875
	GRO-OTM-OF				80	
	HKS-OTB			599		
	RED-OTB			314		
	SHX-LL				1560	
	SKW-OTB			10		
basking shark	GRO-LLS		19255			
	HKS-OTB				70541	
bird	GRO-LLS	379		676		
	SWO-LL	1266		187		
	TUN-LL	51				
blue shark	GRO-LLS				4899	
	M-ST2			6175		
	SHX-LL	2309				
	SWO-LL	446831	495041	405647	517449	847054
	TUN-LL	8637	2104		95253	39274
bluefin tuna	HM-OTM					2259
	SHX-LL	94				
	SWO-LL	17629	32632	22512	2093	5245
	TUN-LL	90	123			414
butterfish	GRO-OTB	94				3360
	GRO-OTB-OF	34	42			
	HKS-OTB		279			818

4VW Species	Fishery	2002	2003	2004	2005	2006
capelin	GRO-OTB-OF		21			
	PAN-OTS			641	4867	
	SKW-OTB			5		
cod(atlantic)	CRJ-FPO	554				
	CRQ-FPO	126	113	282	10	
	CUK-DR				23	
	GRO-LLS	22	35	338	3625	
	GRO-OTB		32			
	HKS-OTB		1080			
	PAN-OTS			26	203	419
coral	GRO-LLS		35			
cusk	CRJ-FPO	2197				
	GRO-LLS		131		4311	
	HKS-OTB		35			27
	PAN-OTS			13		
dolphin	HKS-OTB	4114				
	SWO-LL		900			
eel	RED-OTB			288		
eelpout	GRO-OTB-OF		127			
	HKS-OTB		70			
	PAN-OTS			1079	16020	5172
	RED-OTB-OF					14
eggs	GRO-OTB		32			
fathead	SWO-LL				942	
fish doctor	PAN-OTS				101	
fourbeard rockling	PAN-OTS					419
haddock	CUK-DR				2	
	GRO-LLS	22				
	HKS-OTB		1254			
	SKW-OTB			5		
halibut(atlantic)	GRO-LLS	39659	32050	24352	35274	4625
	GRO-OTB	245	226			224
	GRO-OTB-OF	1361	1568			
	HKS-OTB		35		1221	6548
	RED-OTB		101			
	RED-OTB-OF					513
	SKW-OTB	9		88		
herring(atlantic)	GRO-OTB	94				
	GRO-OTB-OF	10340	106			
	HER-PS	554				
	HKS-OTB	31704	8256	61776	140716	7994
	HM-OTM				450	356
	PAN-OTS			3430	40152	140
	RED-OTB		51			

4VW Species	Fishery	2002	2003	2004	2005	2006
jellyfish	CRQ-FPO			192		
	GRO-OTB		258			
	GRO-OTB-OF	130	1081			
	GRO-OTM-OF				2608	
	RED-OTB			2332		
	RED-OTB-OF			284		42
Jonah crab	CRJ-FPO	132243				
	CRQ-FPO	459	441	77		
	GRO-LLS	22	35		196	
	HKS-OTB		139			
	HM-OTM					2
	SKW-OTB			15		
lamprey	SHX-LL	4				
	TUN-LL					1
lancetfish	SHX-LL	67				
	SWO-LL	449	977	685	1465	1056
	TUN-LL	7				56
leatherback sea turtle	CRQ-FPO				6268	2396
	M-ST2			611		
	SWO-LL	8677	25844	19729	40531	6199
	TUN-LL					581
loggerhead sea turtle	M-ST2			168		
	SWO-LL	6942	70459	1038	29753	34129
	TUN-LL				1018	4841
lumpfish	GRO-OTB		129			
	GRO-OTB-OF	1344	1964			
	GRO-OTM-OF				135	
	SKW-OTB	18		134		
mackerel(atlantic)	CUK-DR				2	
	GRO-OTB		65			
	GRO-OTB-OF	258				
	HKS-OTB		35	737	1210	7885
	HM-OTM					189
mahi mahi	SWO-LL	265	463		907	
	TUN-LL					14
marine invertebrates (ns)	SKW-OTB			26		
marlin	SWO-LL		20238		23963	36343
	TUN-LL					481
monkfish	GRO-OTB		129			
	GRO-OTB-OF		136			
	HKS-OTB		209	138	1484	
	HM-OTM				2	
	RED-OTB		13			
	RED-OTB-OF					513
	SHX-LL	10		43		
	SKW-OTB			180		
	SWO-LL	31			314	
	TUN-LL	1			41	3

4VW Species	Fishery	2002	2003	2004	2005	2006
northern hagfish	GRO-LLS		35		196	
northern shrimp	CRQ-FPO				10	
	GRO-OTB		161			
	PAN-OTS				42180	5871
	SKW-OTB			57		
northern stone crab	CRJ-FPO	1204				
	CRQ-FPO	850	486	448		96
	GRO-LLS		69	68	98	
	GRO-OTB	141	614			
	GRO-OTB-OF		127			
	GRO-OTM-OF				4	
	SKW-OTB	40		155		
northern wolffish	GRO-LLS		13448	20902	11170	1034705
	GRO-OTM-OF				80	
	HKS-OTB			46		
	RED-OTB-OF					42
ocean quahaug	CUK-DR				6	
ocean sunfish	SWO-LL	3552			6976	
	TUN-LL					895
octopus	RED-OTB-OF					14
off-shore hake	GRO-LLS			135		
	HKS-OTB		35			
	PAN-OTS			9		
opah	SWO-LL					1601
	TUN-LL					3
other crabs	CRQ-FPO	563	5472	166	41	24
	CUK-DR				116	
	RED-OTB			131		
	RED-OTB-OF			47		125
	SKW-OTB			10		
other dogfish	GRO-LLS	24291	52662	17385	16363	70214
	GRO-OTB-OF	1491	29905			
	GRO-OTM-OF				261	
	RED-OTB			5634		
	RED-OTB-OF			2464		20016
other flounders	CRQ-FPO	11	23	51	20	
	CUK-DR				76	
	GRO-OTB		129			
	HKS-OTB		4006			
	PAN-OTS			18010	101192	16076
	SKW-OTB			21		
other grenadiers	GRO-OTB	9				
	RED-OTB			262		
	RED-OTB-OF					638

4VW Species	Fishery	2002	2003	2004	2005	2006
other hakes	CRJ-FPO	879				
	CUK-DR				2	
	HKS-OTB		25222	230	2132	
	PAN-OTS				406	
	RED-OTB-OF					69
other sharks	GRO-LLS					1210870
	GRO-OTB	2355				
	SWO-LL	3450		5711	17963	29735
	TUN-LL					987
other shrimp	GRO-OTB-OF	19				
	HKS-OTB				41	
	RED-OTB			183		
other skates	GRO-LLS	67				
	GRO-OTB	113	129			
	GRO-OTB-OF	172	212			
	HKS-OTB	27	488	330		82
	RED-OTB-OF					2205
other tuna	SHX-LL	185				
	SWO-LL	2950	2623	1973	3279	4871
	TUN-LL					227
other turtles	M-ST2			46		
	SWO-LL			1661	26614	
	TUN-LL					204
pollock	HKS-OTB		975		267	
	HM-OTM					3
porbeagle	GRO-OTB-OF	1446				
	HM-OTM				30	276
	M-ST2			631		
	SHX-LL	891				
	SWO-LL	12342	39293	15056	29369	31983
	TUN-LL	313	1712		1018	1715
ray	SWO-LL	694	1594	83	6453	2146
	TUN-LL				244	927
red deepsea crab	CRJ-FPO	1605				
redfish	CRJ-FPO	229				
	CRQ-FPO	57			10	48
	GRO-LLS		17			
	GRO-OTB	283	97			
	HKS-OTB		1916	323	1266	
	PAN-OTS			1908	23017	979
	RED-OTB-OF					27742
	SKW-OTB			10		
rock grenadier(roundnose)	CRQ-FPO				10	
rosefish(black belly)	HKS-OTB		35			
sand dollars	CUK-DR				175	
sand lance	GRO-OTB		65			
	HM-OTM					67
	PAN-OTS			3	101	

4VW Species	Fishery	2002	2003	2004	2005	2006
scallop	CRQ-FPO		23		10	
	CUK-DR				75	
	HKS-OTB				326	
	PAN-OTS			3		
sculpin	CRJ-FPO	974				
	CRQ-FPO	23			10	
	CUK-DR				56	
	GRO-LLS		17			
	GRO-OTB	141	1873			112
	GRO-OTB-OF	896	42			
	HKS-OTB		70		41	27
	PAN-OTS			564	101	
	SKW-OTB			495		
sea anemone	RED-OTB-OF					42
sea corn	GRO-LLS	45	39			
sea cucumbers	CRQ-FPO	11	23		61	24
	CUK-DR				754	
	GRO-OTB		4909			
sea mouse	CUK-DR				20	
sea urchins	CRQ-FPO					12
	CUK-DR				230	
	SKW-OTB			10		
seals (ns)	SWO-LL		3472			
shad american	GRO-OTB-OF	52				
	HKS-OTB					218
	SKW-OTB			10		
shortfin mako	M-ST2			31		
	SWO-LL	929	16303	8245	22533	10933
	TUN-LL				61	466
shortspine tapirfish	GRO-OTB-OF	345				
silver hake	CUK-DR				17	
	GRO-OTB		32			
	HKS-OTB		2439	461	21350	
	PAN-OTS			1219	1115	47530
	RED-OTB-OF			46		
smooth skate	GRO-OTB		1001			
	GRO-OTB-OF	362	487			
	HKS-OTB	137	557			5156
	RED-OTB	256		9958		
	SKW-OTB			108		
snake blenny	PAN-OTS				710	
snake mackerel	SWO-LL	184				2112
	TUN-LL					10

4VW Species	Fishery	2002	2003	2004	2005	2006
snow crab	CRQ-FPO	2392795	1726627	1235278	1127031	999516
	CUK-DR				308	
	GRO-LLS	45	432	1082	980	
	GRO-OTB		4683			
	GRO-OTB-OF	17	21			
	HM-OTM					3
	PAN-OTS			222	913	839
	SKW-OTB	40		3338		
spiny dogfish	GRO-LLS	4127	1334	1015	980	
	GRO-OTB	1036				
	GRO-OTB-OF	22144	233			
	GRO-OTM-OF				41	
	HER-PS	135				
	HKS-OTB	2029	6096	37682	5256	1119
	HM-OTM					45
	RED-OTB	45410	355			
	RED-OTB-OF					14
	SHX-LL	55			217	
	SKW-OTB	124		5		
spinytail skate	GRO-LLS		828			
sponges	GRO-OTB	8270				
	GRO-OTB-OF		2120			
	HM-OTM					2
	RED-OTB-OF			274		153
	SKW-OTB			26		
spotted wolffish	CRQ-FPO		23	474		60
	GRO-LLS			26517	1470	3364
	RED-OTB			288		
	RED-OTB-OF			47		208
squid	GRO-OTB	9				
	GRO-OTB-OF	264				
	HKS-OTB	1508	105	1582	51091	33175
	HM-OTM					6543
	PAN-OTS			1807	811	559
	RED-OTB			341		
	RED-OTB-OF					694
starfish	CRQ-FPO			13	71	
	CUK-DR				41	
	GRO-OTB		65			
	GRO-OTB-OF	69				
	PAN-OTS			54		
	RED-OTB			131		
	RED-OTB-OF			9		
	SKW-OTB			10		

4VW Species	Fishery	2002	2003	2004	2005	2006
striped atlantic wolffish	CRJ-FPO	1643				
	CRQ-FPO	23	11	154		60
	GRO-LLS				784	
	HKS-OTB					27
	PAN-OTS				304	
	SKW-OTB			10		
swordfish	HKS-OTB	1508				
	M-ST2			137		
	SWO-LL	15608	72774	11734	42135	22242
	TUN-LL	166			713	1107
thorny skate	CRQ-FPO	23	102	13	10	36
	GRO-LLS	3100	5285	6426	48110	
	GRO-OTB	3316	61559			
	GRO-OTB-OF	4304	2412			
	HKS-OTB	27	244		326	3792
	PAN-OTS			234	2433	
	RED-OTB		13	13365		
	RED-OTB-OF			728		
	SHX-LL			107		
	SKW-OTB	581		13157		
threadfin seasnail	CRQ-FPO				10	
toad crab	CRQ-FPO	253	23			
	SKW-OTB			26		
turbot	CRQ-FPO			26		
	GRO-LLS				196	
	HKS-OTB		35			
	PAN-OTS			22763	4461	140
white hake	CRJ-FPO	1070				
	CRQ-FPO	69				
	CUK-DR				8	
	GRO-LLS	1718	917		5487	
	GRO-OTB		32			
	HKS-OTB		348		1333	
	PAN-OTS			12		
winter skate	CRQ-FPO	46				
	GRO-LLS	1985	1238		13914	24806
	GRO-OTB	188	51773			
	GRO-OTB-OF	10098	1123			
	HKS-OTB					12823
	SHX-LL	25				
	SKW-OTB	15910		94701		
wrymouth	GRO-LLS				686	

4X5Y Species	Fishery	2002	2003	2004	2005	2006
alewife	GRO-GNS			185		
	GRO-OTB	2566	4298	5719	318	
	GRO-OTB-OF	273	2152			
	HKS-OTB	20		1459		3740
	RED-OTB	216		1783	459	141
	RED-OTB-OF			1237	122	116
	SCU-OTB				19	30
alligatorfish	GRO-OTB		361			
	GRO-OTB-OF	45				
	SCA-DR				84	
american atlantic sturgeon	SCU-OTB					68
american john dory	RED-OTB	4				
	RED-OTB-OF					43
american lobster	CRQ-FPO			75		
	CUK-DR				9736	
	GRO-GNS	69006	7392	8222	39904	
	GRO-LLS		7342	349	269	
	GRO-OTB	29559	86326	262964	128405	143503
	GRO-OTB-OF	3152	12578	12767		9407
	HKS-OTB	730	3802	212		
	LBA-FPO-OF	124987	137484	478357	204645	204235
	RED-OTB	10877	49518	34563	60792	4779
	RED-OTB-OF		290	3215	773	8238
	SCA-DR	36900	66876	26351	36195	75873
	SCA-DR-OF			7564		
	SCU-OTB	4900	6195	7600	11078	12954
	SKW-OTB		3111	12602		
argentine	GRO-GNS				1676	
	GRO-OTB	170	40		247	
	GRO-OTB-OF	542	67	21		
	HKS-OTB	1304	271			
	RED-OTB	468	37		184	226
	RED-OTB-OF			76		840
atlantic rock crab	CRQ-FPO	944				
	CUK-DR				4520	
	GRO-GNS				5585	
	GRO-LLS				90	
	GRO-OTB		441		141	
	HKS-OTB		452			
	LBA-FPO-OF	360		606	253	
	RED-OTB		4154	3327	23417	28
	SCA-DR	152594	152817	82705	36919	198298
	SCA-DR-OF			33429		
	SCU-OTB		3371	1788	6369	4277

4X5Y Species	Fishery	2002	2003	2004	2005	2006
atlantic torpedo	GRO-OTB			1448	706	
	GRO-OTB-OF	184				
	HKS-OTB	51	90			
	RED-OTB	260			337	
barnacles	SCA-DR					2231
barndoor skate	GRO-GNS				621	
	GRO-LLS	1356	182976	94879	141320	60591
	GRO-OTB		3210	18966	11926	21980
	GRO-OTB-OF	348	2085			1646
	HKS-OTB			278		
	RED-OTB	55	1372	2570	30763	1188
	RED-OTB-OF		1068	1065	271	1752
	SCA-DR	446				57
	SCA-DR-OF			458		
	SKW-OTB		283			
barracudina	RED-OTB				31	
	SWO-LL				526	
basking shark	HKS-OTB			15593		
	RED-OTB	3934				
	RED-OTB-OF			38907		
bird	GRO-GNS			647	1427	
	GRO-LLS	2441	376		448	
	SWO-LL	8	31			
	TUN-LL					2
bivalve	SCA-DR	1027	56757	225308	152672	8048
blue shark	BFT-LHP	557		5019		
	BFT-LTL	4732				
	GRO-LLS		11295	3139		
	HER-PS	510				
	SHX-LL	393				
	SWO-LL	166882	77202	44538	63084	87187
	TUN-LL				1860	21800
bluefin tuna	SWO-LL	27722	6521			
	SWO-LTL	2316	741			
	TUN-LL				64	426
butterfish	GRO-OTB	68				
	GRO-OTB-OF	163				
	HKS-OTB	269				
	RED-OTB	8				
	SCU-OTB					1
capelin	SCU-OTB					1
clam	SCA-DR	179		313120	12981	
	SCU-OTB				4	30
cod(atlantic)	GRO-GNS		31171	924	9743	
	GRO-LLS		3012			
	GRO-OTB		843		71	
	HER-PS	510	2160	3383		
	LBA-FPO-OF	135	2017	1161	955	1201

4X5Y Species	Fishery	2002	2003	2004	2005	2006
cod(atlantic)	RED-OTB	35				
	SCA-DR	312	1332	348	171	432
	SCA-DR-OF			17064		
	SCU-OTB			4	2	7
coral	GRO-GNS		356			
	GRO-LLS		376			594
	GRO-OTB-OF		22			
	HKS-OTB	30				
	SCA-DR					1612
cunner	CUK-DR				695	
	SCU-OTB					9
cusk	GRO-LLS		565			
	GRO-OTB			3040	141	
	GRO-OTB-OF	29				
	LBA-FPO-OF	13130	11758	20133	16445	9057
	SCA-DR		89			
	SCA-DR-OF			136		
cutlassfishes (ns)	SWO-LL				841	
dolphin	HKS-OTB		1851			
	RED-OTB-OF			2568		
	TUN-LL					519
eel	RED-OTB				31	
	SCA-DR-OF			229		
eelpout	GRO-OTB	1090	2021	1605	3070	
	GRO-OTB-OF	4				
	HKS-OTB	90				
	RED-OTB	433	111	352	2112	
	SCA-DR	89	178	433		124
	SCA-DR-OF			1145		
	SCU-OTB	279	49	42	92	198
eggs	SCA-DR					992
finfishes (ns)	LBA-FPO-OF					177
haddock	GRO-GNS				62	
	GRO-LLS		4894	930	1882	
	GRO-OTB		1605	11510	494	
	GRO-OTB-OF	122				
	LBA-FPO-OF		443	101	331	12
	RED-OTB	8				
	SCA-DR	313	266			66
	SCA-DR-OF			9532		
halibut(atlantic)	GRO-GNS				62	
	GRO-LLS	27934	84335	12906	46688	9207
	GRO-OTB	4221	4454	57361	25369	25027
	GRO-OTB-OF	799	404	252		
	HKS-OTB	2069	36	11		
	RED-OTB	1758	1372	866	1592	283
	RED-OTB-OF			3900	163	72
	SCA-DR		472	52		

4X5Y Species	Fishery	2002	2003	2004	2005	2006
halibut(atlantic)	SCA-DR-OF			2185		
	SCU-OTB		14	19	13	19
	SKW-OTB			3934		
helocid pteropod	SCA-DR				5025	
herring(atlantic)	GRO-GNS			277		
	GRO-OTB	27748	5939	1516	1270	
	GRO-OTB-OF	2410	986	63		
	HER-PS	16595587	16227797	3470772	149851	
	HKS-OTB	537		178		4538
	RED-OTB	1621	223	216	643	198
	RED-OTB-OF		168	628	14	
	SCA-DR-OF			458		
	SCU-OTB				85	263
	SKW-OTB		162			
hydrozoa	SCA-DR	89				
jellyfish	GRO-OTB		120	36	106	
	HKS-OTB	10				
	RED-OTB	8			92	28
	SCA-DR	45	622			
	SCU-OTB					5
Jonah crab	CRQ-FPO	1036			2685	24
	CUK-DR				4520	
	GRO-GNS	57505	47914	16721	8998	
	GRO-LLS	814				
	GRO-OTB	11851	6902		141	236
	GRO-OTB-OF	4	45			
	HKS-OTB	30	154			
	LBA-FPO-OF	65156	74068	193866	87972	43023
	RED-OTB	4524	15022	18907	21458	
	SCA-DR	74585	242094	105786	125022	118906
	SCA-DR-OF			7082		
	SCU-OTB	12357	3525	3403	3730	3146
	SKW-OTB		81			
lamprey	HKS-OTB	10				
	RED-OTB		37			
	SCA-DR			66		
lancetfish	SWO-LL	1153	655		158	
	TUN-LL					17
lanternfish	RED-OTB	20				
leatherback sea turtle	SWO-LL	29273	24023		18399	72789
	TUN-LL				210	1039
loggerhead sea turtle	SWO-LL	8243	2340		6046	159976
	TUN-LL					303
lumpfish	GRO-GNS				2420	
	GRO-OTB	443	1013	5050	7735	5338
	GRO-OTB-OF	330	112	21		
	HER-PS			24	150	
	HKS-OTB	50				

4X5Y Species	Fishery	2002	2003	2004	2005	2006
lumpfish	RED-OTB	315		487	520	226
	RED-OTB-OF				68	58
	SCA-DR		120		97	124
	SCA-DR-OF			545		
	SCU-OTB			44	17	68
	SKW-OTB			266		
mackerel(atlantic)	BFT-LTL					429
	GRO-OTB	35076	40	145	35	
	GRO-OTB-OF	8846	202			
	HKS-OTB	20		33		6783
	RED-OTB	67		27	61	28
	RED-OTB-OF				14	
mahi mahi	SWO-LL	663			158	
	TUN-LL					47
marlin	BFT-LTL	6890				
	SWO-LL	9246			35642	62391
	TUN-LL					147
mollusca sp.	SCA-DR	1161	5285			
	SCU-OTB				4	23
monkfish	GRO-OTB		522		1305	157
	GRO-OTB-OF	212				
	HER-PS			213		
	HKS-OTB	696				
	LBA-FPO-OF			252	97	25
	RED-OTB	47				
	SCA-DR	69125	30365	18269	10872	6969
	SCA-DR-OF			228811		
	SCU-OTB					1
	SWO-LL		94			
mussels	CUK-DR				2434	
	RED-OTB	4	556	54		
	SCA-DR	110887	162882	226571	284392	304532
	SCU-OTB	4	273	2	2	65
northern hagfish	GRO-OTB-OF	4				
northern shrimp	GRO-OTB			36		
	SCU-OTB				64	9
northern stone crab	CRQ-FPO	1267	1515		582	142
	GRO-GNS		89		186	
	GRO-LLS		565		358	1188
	GRO-OTB	34	321	362	212	
	GRO-OTB-OF		22			
	HKS-OTB	30				
	LBA-FPO-OF	113				
	RED-OTB	63			61	28
northern wolffish	GRO-LLS				12277	
	GRO-OTB					707
	LBA-FPO-OF				156	
	RED-OTB	12				

4X5Y Species	Fishery	2002	2003	2004	2005	2006
ocean quahaug	CUK-DR				348	
	SCA-DR				84	
ocean sunfish	GRO-OTB				6386	
	SWO-LL	5598				
	TUN-LL					173
octopus	GRO-OTB-OF	4				
	HKS-OTB	10				
	RED-OTB				31	
	SCA-DR		245			
off-shore hake	GRO-LLS				90	
	GRO-OTB			36		
	GRO-OTB-OF	216				
	HKS-OTB	102				
	RED-OTB	193			398	
opah	GRO-OTB		6019			
	GRO-OTB-OF	4				
other crabs	CRQ-FPO	46		635		
	GRO-LLS					297
	GRO-OTB		161		106	157
	RED-OTB	16				
	SCA-DR	107237	41631	35362	31052	24567
	SCU-OTB				32	
other dogfish	GRO-LLS				1075	116726
	GRO-OTB	3644				
	HER-PS	5102				
	RED-OTB				184	12866
other flounders	CUK-DR				2086	
	GRO-GNS				372	
	GRO-OTB	681	1083	109	141	157
	GRO-OTB-OF	190				
	HER-PS			24		
	HKS-OTB	366	54			
	RED-OTB	142	445	4679	8387	
	RED-OTB-OF			19		
	SCA-DR	6918	9293	14610	4876	4207
	SCA-DR-OF			120808		
	SCU-OTB	175	655	1671	1214	1227
other grenadiers	GRO-OTB	204			35	
	GRO-OTB-OF	4	22			
	HKS-OTB	254				
	RED-OTB	138			92	
	SKW-OTB		40			
other hakes	GRO-LLS	814				
	GRO-OTB		281		35	
	GRO-OTB-OF	12				
	HKS-OTB	2219				
	LBA-FPO-OF	288	1427	959	1754	1802
	RED-OTB	618			582	

4X5Y Species	Fishery	2002	2003	2004	2005	2006
other hakes	RED-OTB-OF			171		
	SCA-DR-OF			2655		
other sharks	HER-PS		635	3549		
	SWO-LL	3674	4227			
	TUN-LL					814
other shrimp	GRO-OTB			36		393
other skates	GRO-GNS			185	124	
	GRO-LLS	121229	9412	144877	7886	
	GRO-OTB	4223	5979	19799	58831	16672
	GRO-OTB-OF	3021	336			
	HKS-OTB	5212	3341			
	RED-OTB	4658	12055	491	14540	650
	RED-OTB-OF				597	
	SCA-DR	18484	60245	21142	9408	19344
	SCA-DR-OF			43962		
	SCU-OTB	25		10	2002	3370
other sturgeon	GRO-GNS				4034	
	GRO-OTB			652		
	RED-OTB	413			2755	
	SCU-OTB	250		57	353	49
other tuna	BFT-LTL				389	
	SWO-LL	7604	156		26968	
	TUN-LL					242
other turtles	SWO-LL				12880	
pelagic sea snail	SCA-DR			1628	1340	1033
	SCU-OTB					1
pollock	GRO-GNS		43906	3788	8130	
	GRO-LLS		376			
	GRO-OTB		80		71	
	GRO-OTB-OF	184				
	RED-OTB	8				
	SCA-DR	45				
	SCA-DR-OF			229		
porbeagle	GRO-GNS		36960	7391		
	GRO-LLS	6238				
	GRO-OTB		5618		4799	10676
	GRO-OTB-OF	204		968		
	HER-PS	13649	3177			
	SHX-LL	702				
	SWO-LL	5498	11356			
	TUN-LL				17	248
pricklebacks	SCA-DR					41
puffer	SCA-DR					57
	SWO-LL				210	
rainbow smelt	SCU-OTB				34	30
ray	SWO-LL	5150	406		1998	21997
	TUN-LL					17

4X5Y Species	Fishery	2002	2003	2004	2005	2006
red deepsea crab	CRQ-FPO				90	
	GRO-LLS				627	
	GRO-OTB	238	80			
	HKS-OTB	10				
	RED-OTB	4			275	
redfish	CUK-DR				348	
	GRO-GNS	46004		370	62	
	GRO-LLS	814				
	GRO-OTB		241		35	
	GRO-OTB-OF	3707				
	HKS-OTB	70				
	LBA-FPO-OF	182	49	101	273	337
	RED-OTB	1251	18546			1272
	SCA-DR			179	227	107
	SCA-DR-OF			594		
remora	TUN-LL					3
rock grenadier(roundnose)	GRO-OTB-OF	4				
	RED-OTB				31	
rosefish(black belly)	GRO-LLS	5153				
	HKS-OTB	1910				
	LBA-FPO-OF	735	221	202	234	87
	RED-OTB	24				
roughhead grenadier	GRO-OTB-OF	4				
sand dollars	SCA-DR			165		289
sand lance	SCA-DR		89		144	
	SCU-OTB					1
scallop	CUK-DR				695	
	GRO-GNS		89		62	
	GRO-OTB	68			1235	
	HKS-OTB		9			
	RED-OTB	59	3264	947	3153	
	SCA-DR	699968	1259357	1389390	1640546	658213
	SCA-DR-OF			1784140		
	SCU-OTB	32	498	1284	549	558
sculpin	CRQ-FPO	92			90	
	CUK-DR				3825	
	GRO-GNS			92	683	
	GRO-LLS	271	2824	1279	1075	594
	GRO-OTB	10591	15551	32330	18030	28339
	GRO-OTB-OF	1847	785	84		
	HKS-OTB	905	45			
	LBA-FPO-OF		172	303	19	77
	RED-OTB	1503	705	811	92	170
	RED-OTB-OF			57	122	623
	SCA-DR	94025	116124	106577	93337	103008
	SCA-DR-OF			38607		
	SCU-OTB			10	2	49

4X5Y Species	Fishery	2002	2003	2004	2005	2006
sea anemone	GRO-LLS		188			
	HKS-OTB	10				
	LBA-FPO-OF	40				
	RED-OTB	12	37			
	SCA-DR		156			248
sea corn	GRO-LLS		3388			5940
sea cucumbers	SCA-DR	84478	14163	58398	494405	490593
	SCA-DR-OF			8701		
	SCU-OTB	7			6	8
sea peach	SCA-DR					1281
sea potato	SCA-DR					248
sea squirt	SCA-DR					455
sea urchins	CUK-DR				695	
	GRO-OTB		120	72		
	LBA-FPO-OF	40				
	SCA-DR	100666	43297	20050	94132	69670
	SCU-OTB					20
seals (ns)	CRQ-FPO	921				
seaweed	CUK-DR				2086	
	GRO-OTB		441		423	2355
	HER-PS		101662			
	RED-OTB	4				
	SCA-DR	179	257563	55148	586	1984
shad american	GRO-GNS		89	1940	42200	
	GRO-OTB	375	2364	3800	1235	5495
	GRO-OTB-OF	814	1166	379		
	HER-PS			24		
	HKS-OTB	30				
	RED-OTB	456		27	1163	311
	RED-OTB-OF			9684	27	825
	SCU-OTB				6	4
	SKW-OTB			19280		
shortfin mako	BFT-LHP			2868		
	GRO-GNS				35560	
	GRO-OTB-OF	277				
	HER-PS			8281		
	SWO-LL	3914	905			46393
	TUN-LL					258
shrimp	SCA-DR		1332		84	41
	SCU-OTB				85	1
silver hake	GRO-GNS		178	1848	62	
	GRO-OTB	136		1303	35	79
	GRO-OTB-OF	1028	291			
	HKS-OTB	6094		2940		
	LBA-FPO-OF	23				
	RED-OTB	763		520	1775	
	RED-OTB-OF		122	95		
	SCA-DR-OF			4666		

4X5Y Species	Fishery	2002	2003	2004	2005	2006
silver hake	SCU-OTB					14
	SKW-OTB		202			
smooth skate	CUK-DR				695	
	GRO-GNS				62	
	GRO-LLS		45744	1279	896	
	GRO-OTB	3916	3732	42829	9280	1963
	GRO-OTB-OF	759	673	1115		
	HKS-OTB	60				
	LBA-FPO-OF				19	
	RED-OTB	429	260	135	520	170
	RED-OTB-OF		717		976	
	SCA-DR	14508	2043	3906	5025	248
	SKW-OTB		1172	2430		
snails and slugs	SCA-DR	580	7017			661
snake blenny	SCU-OTB				2	11
snake mackerel	SWO-LL	589			4416	
snow crab	CRQ-FPO	169323	903186	83388	67442	52679
	HKS-OTB	30				
	RED-OTB	20				
	SCA-DR					2603
	SKW-OTB			78		
spiny dogfish	GRO-GNS	4893694	482347	899346	946703	
	GRO-LLS	514205	470430	141738	717712	847673
	GRO-OTB	170763	34635	2078748	308593	737357
	GRO-OTB-OF	105611	74862	272971		253
	HER-PS	501439	519112	67688		
	HKS-OTB	87841	50057	59266	147	249
	LBA-FPO-OF				58	
	RED-OTB	145698	171736	217859	205638	305393
	RED-OTB-OF			25779	529399	23152
	SCA-DR		1332			
	SHX-LL	393				
	SKW-OTB			2680		
spinytail skate	GRO-OTB			109		
	SCA-DR		533			
sponges	CUK-DR				7650	
	GRO-OTB	9637			1799	
	GRO-OTB-OF	1411				
	HKS-OTB	10				
	RED-OTB	24				28
	SCA-DR	233742	131922	208890	158953	22810
	SCU-OTB				4	9
spotted wolffish	HKS-OTB		81			
	RED-OTB	20	74			
squid	GRO-OTB	68	120	716	141	
	GRO-OTB-OF	387				
	HER-PS			24		
	HKS-OTB	498	163	33		

4X5Y Species	Fishery	2002	2003	2004	2005	2006
squid	RED-OTB	43	37	54	245	85
	SCA-DR			460		
	SCU-OTB					12
starfish	CUK-DR				29556	
	GRO-GNS		356	92		
	GRO-LLS		188	116	448	
	GRO-OTB	7901	7744	20450	459	79
	GRO-OTB-OF	8	112			
	HKS-OTB		208			
	LBA-FPO-OF	40			39	50
	RED-OTB	287	21847		214	
	SCA-DR	507643	504617	845951	374673	416043
	SCA-DR-OF			108148		
	SCU-OTB	21	4026	94	278	266
stout sawpalate	RED-OTB				61	
striped atlantic wolffish	GRO-LLS		9036			
	GRO-OTB			1882	565	3335
	GRO-OTB-OF	73				
	LBA-FPO-OF			1615	195	62
	RED-OTB	35				
	RED-OTB-OF					130
	SCA-DR			888	335	124
	SCA-DR-OF			13878		
	SKW-OTB			47		
swordfish	SWO-LL	17962	11902	4454	12249	54392
	TUN-LL				101	379
thorny skate	CRQ-FPO	23				
	GRO-GNS				621	
	GRO-LLS	133162	281618	54997	27601	7425
	GRO-OTB	17742	30086	94989	19547	62408
	GRO-OTB-OF	5167	3296	2692		747
	HKS-OTB	949	298			
	RED-OTB	3674	8717	5491	367	198
	RED-OTB-OF			1522	27	1100
	SCA-DR	2464	28940	19882	11231	12063
	SCA-DR-OF			27833		
	SCU-OTB	954	971	1589	1666	981
	SKW-OTB			4436		
tile fish	RED-OTB-OF		351	57		
toad crab	CRQ-FPO			187		24
	GRO-OTB	34				
	SCA-DR				335	744
turbot	RED-OTB	4				
unid. fish	SCA-DR					7645
whales (ns)	HER-PS			828064		
whelks	SCA-DR					2645
	SCU-OTB				6	

4X5Y Species	Fishery	2002	2003	2004	2005	2006
white hake	GRO-GNS		70980	277	27430	
	GRO-LLS				1792	
	GRO-OTB		321	4597		
	GRO-OTB-OF	204	45			
	HKS-OTB	219	18			
	LBA-FPO-OF	1531	492	2018	1150	262
	RED-OTB	539				
	SCA-DR	45				
	SCU-OTB					64
	SHX-LL	56				
winter skate	GRO-LLS		565	1046	20432	125339
	GRO-OTB	391	34588	128143	67674	112570
	GRO-OTB-OF	832	112	5742		367
	HKS-OTB	288	18	223		
	RED-OTB	448		1677	1531	
	RED-OTB-OF					1737
	SCA-DR	10223	21447		18827	4625
	SCU-OTB				752	362
	SKW-OTB		202			
wrymouth	SCU-OTB				2	27

5Z Species	Fishery	2002	2003	2004	2005	2006
alewife	GRO-OTB					6
	SCA-DR-OF				16	
american eel	SCA-DR-OF			73		
american lobster	GRO-GNS	76	46	70		
	GRO-LLS	74	155	238	625	732
	GRO-OTB	47650	22553	16650	12076	15959
	GRO-OTB-OF	7152	3758	2821	4318	13595
	HER-OTM		74			
	LBA-FPO-OF	29330	148586		119851	174353
	M-GS					13
	SCA-DR-OF			148691	80704	69541
	YEL-OTB		8667	3844	381	113
argentine	GRO-OTB	100				15
	GRO-OTB-OF					24
atlantic rock crab	GRO-OTB	384	66			
	GRO-OTB-OF	165				
	LBA-FPO-OF		2587			
	SCA-DR-OF			20333	3445	3223
atlantic saury	SCA-DR-OF					33
atlantic spiny lumpsucker	GRO-OTB				33	
atlantic torpedo	GRO-OTB	2384	331	875	367	15
	GRO-OTB-OF	589	743	253		68
	SCA-DR-OF				148	1465
barndoor skate	GRO-GNS	346				
	GRO-LLS	31122	47796	29691	35484	77915
	GRO-OTB	6820	53426	26027	14806	12884
	GRO-OTB-OF	1602	194	1411	4737	6483
	M-GS					1473
	SCA-DR-OF			10626	34638	79596
	YEL-OTB		1533	23145	1042	867
basking shark	GRO-LLS			60558		
	GRO-OTB-OF					897
bird	GRO-GNS	261				
	GRO-LLS	74	39		100	
	GRO-OTB-OF		17	11		
bivalve	SCA-DR-OF				135	2531
blue antimora/hake	GRO-LLS		10			
blue shark	BFT-LTL				3584	
	GRO-LLS	12657	6693	3589		2568
	HER-OTM	217				
	SWO-LL	28583	61254			30226
bluefin tuna	SWO-LL	2915	36934			
butterfish	GRO-OTB	53				3
clam	GRO-OTB					107
	SCA-DR-OF				1552	
	YEL-OTB					38

5Z Species	Fishery	2002	2003	2004	2005	2006
cod(atlantic)	GRO-LLS			52		
	GRO-OTB	199	177	154		205
	GRO-OTB-OF			101		
	LBA-FPO-OF	2570	2490		3387	306
	SCA-DR-OF	122834		139831	77911	134756
coral	GRO-GNS		213			
	GRO-LLS	260	177	206	62	
	GRO-OTB	243				
	GRO-OTB-OF		17			
cunner	GRO-OTB	26	66	43	28	98
	GRO-OTB-OF		127			2
	SCA-DR-OF			3268	886	569
	YEL-OTB		70			2
cusk	GRO-LLS		13209	8050		27
	GRO-OTB	13	254			21
	GRO-OTB-OF		8			9
	LBA-FPO-OF	5835	8084		33744	13255
dolphin	GRO-OTB-OF					165
	SWO-LL	376				
eel	GRO-OTB				178	12
	SCA-DR-OF			444	273	196
eelpout	GRO-LLS	19			12	
	GRO-OTB	199	464	747	595	174
	GRO-OTB-OF		17	67	19	19
	SCA-DR-OF			22093	20415	17270
	YEL-OTB			39		
eggs	SCA-DR-OF				3647	1013
grouper,red	GRO-OTB					6
haddock	GRO-GNS		37			
	GRO-LLS		69	4255	125	6332
	GRO-OTB	33105	89	584	1718	355
	GRO-OTB-OF				299	5
	HER-OTM	2	670			
	LBA-FPO-OF					26
	SCA-DR-OF	40353		103920	48828	70410
	YEL-OTB			151		
halibut(atlantic)	GRO-LLS	1169	2389	2020	1312	3154
	GRO-OTB	108	298	532	773	2440
	GRO-OTB-OF	36		28	492	726
	M-GS					158
	SCA-DR-OF			2332	482	336
	YEL-OTB			112		
herring(atlantic)	GRO-OTB	29	22	43	39	18
	GRO-OTB-OF				19	
	SCA-DR-OF			218		
jellyfish	GRO-OTB					107
	GRO-OTB-OF		25			2
	SCA-DR-OF					59

5Z Species	Fishery	2002	2003	2004	2005	2006
Jonah crab	GRO-LLS	19	10	10		
	GRO-OTB	79	2075			3
	GRO-OTB-OF	287	59			
	LBA-FPO-OF	47863	21407		52102	91352
	SCA-DR-OF			27344	11667	747
	YEL-OTB				6	1
lamprey	GRO-OTB					9
	YEL-OTB			68		
lanternfish	SCA-DR-OF				16	
leatherback sea turtle	SWO-LL	7757				21523
lobster	GRO-LLS					14
	GRO-OTB				6	12
loggerhead sea turtle	SWO-LL	2558	3409			1567
lumpfish	GRO-OTB				284	547
	GRO-OTB-OF					2
	SCA-DR-OF			10059	39	
mackerel(atlantic)	GRO-OTB	94	22	86	56	
	YEL-OTB			10		
marine invertebrates (ns)	SCA-DR-OF				127471	60012
marlin	SWO-LL	564				
mollusca sp.	SCA-DR-OF				6459	
monkfish	GRO-LLS				244	
	GRO-OTB		11	17	345	116
	GRO-OTB-OF			67		78
	HER-OTM	22				
	SCA-DR-OF	138433		1875528	949341	1091887
mussels	GRO-LLS				12	
	SCA-DR-OF				3440	270
northern hagfish	GRO-OTB-OF		8			
northern stone crab	GRO-LLS		10			
	GRO-OTB	26	11			
	LBA-FPO-OF		97		22	
northern wolffish	GRO-LLS			165		
	GRO-OTB				250	
	GRO-OTB-OF				222	
ocean quahaug	SCA-DR-OF				153	1772
ocean sunfish	GRO-OTB				3892	
	GRO-OTB-OF	1437	169			
	SWO-LL	621	9091			
off-shore hake	GRO-OTB		11			
	SCA-DR-OF				33	63
other crabs	GRO-OTB				11	
	GRO-OTB-OF		17			5
	LBA-FPO-OF	165				
	SCA-DR-OF			17251	73733	60465

5Z Species	Fishery	2002	2003	2004	2005	2006
other dogfish	GRO-LLS	74		866		
	GRO-OTB				6	3064
	GRO-OTB-OF					5
	YEL-OTB					2
other flounders	GRO-OTB	11746	1412	678	128	223
	GRO-OTB-OF		76		48	42
	HER-OTM	10				
	SCA-DR-OF			440044	165060	247484
	YEL-OTB			220		
other hakes	GRO-LLS	56	30			
	GRO-OTB	755				18
	LBA-FPO-OF	329	550			128
	SCA-DR-OF			9463	3139	20937
other sharks	GRO-LLS	13473	8947	27393		
	GRO-OTB		331			
	GRO-OTB-OF	29840	10135			5310
	SWO-LL	899	3637			3134
other skates	GRO-LLS	17185	23091	32591	5886	2033
	GRO-OTB	333523	127582	32381	11003	6410
	GRO-OTB-OF	92333	11984	2883	494	632
	SCA-DR-OF			1921060	303048	933716
	YEL-OTB			3497	3399	51
other tuna	SCA-DR-OF				617	
	SWO-LL	327	341			
other turtles	SWO-LL		6250			
periwinkles	SCA-DR-OF				2920	5831
pollock	GRO-LLS	928				41
	GRO-OTB	33105			356	52
	GRO-OTB-OF					101
	SCA-DR-OF	582		1384	129	51
porbeagle	GRO-LLS		226		1887	
	GRO-OTB	4644	13254	2489	2018	8713
	GRO-OTB-OF			253	1312	1194
	SWO-LL		1818			8254
ray	GRO-OTB			43		
	SWO-LL	1083	682			282
	YEL-OTB			24		
red deepsea crab	LBA-FPO-OF	3788	32			26
redfish	GRO-LLS	575	187	502		165
	GRO-OTB	26	750			9
	GRO-OTB-OF				10	
	LBA-FPO-OF	773	129		66	434
	SCA-DR-OF				20	
rosefish(black belly)	GRO-LLS	334			1312	1250
	GRO-OTB	199			6	6
	LBA-FPO-OF	165	129			51
roughhead grenadier	GRO-LLS	186				

5Z Species	Fishery	2002	2003	2004	2005	2006
sand lance	GRO-OTB					37
	SCA-DR-OF					182
scallop	GRO-LLS	37		10	150	14
	GRO-OTB	2332	4734	163	100	260
	GRO-OTB-OF	1401	110		10	17
	SCA-DR-OF	108785		7511336	2728163	1415519
	YEL-OTB		1059	151		76
sculpin	GRO-GNS	34				
	GRO-LLS	19		82	203	55
	GRO-OTB	11936	28416	20186	6800	6646
	GRO-OTB-OF	3061	2247	641	2084	2039
	LBA-FPO-OF		162		44	
	M-GS					1
	SCA-DR-OF			587455	231977	425559
	YEL-OTB		1073	4468	210	168
sea anemone	GRO-LLS	19				
sea corn	GRO-GNS	84				
	GRO-LLS	334	738	1711	150	
	GRO-OTB	146				
	GRO-OTB-OF					2
	LBA-FPO-OF	165				
sea cucumbers	GRO-OTB	40	44	9	6	3
	GRO-OTB-OF		8			9
	SCA-DR-OF				5203	6263
sea robin	GRO-OTB			9		
	SCA-DR-OF				17	162
	YEL-OTB			5		
sea urchins	SCA-DR-OF			1145	13164	9566
seals (ns)	GRO-OTB				634	107
	GRO-OTB-OF					375
	SCA-DR-OF				172	
seasnail unidentified	GRO-OTB-OF			11		
seaweed	GRO-OTB					31
	SCA-DR-OF					21521
	YEL-OTB					11
shad american	GRO-OTB	79			50	40
	GRO-OTB-OF				48	7
	YEL-OTB			5		
shortfin mako	GRO-LLS			175		
	GRO-OTB	6621		215	2018	2963
	SWO-LL	169				512
	YEL-OTB					150
shrimp	SCA-DR-OF			171795		
silver hake	GRO-OTB	1311	143	154	6	18
	GRO-OTB-OF		8	6		7
	HER-OTM	101	15			
	SCA-DR-OF			7900	2617	3763

5Z Species	Fishery	2002	2003	2004	2005	2006
smooth skate	GRO-LLS		7845		3087	
	GRO-OTB	14558	88951	5012	1273	759
	GRO-OTB-OF	639	16410	1860	4785	581
	SCA-DR-OF			47586	8087	1098
	YEL-OTB			2019		1
snails and slugs	SCA-DR-OF				9111	
	YEL-OTB					2
snake mackerel	SWO-LL					42
snow crab	LBA-FPO-OF				22	
spiny dogfish	GRO-GNS	17				
	GRO-LLS	1670	177	10357	15797	189629
	GRO-OTB	4460	82	1219	183	108655
	GRO-OTB-OF	12437		1107	135	13859
	LBA-FPO-OF				87	
	M-GS					4
	SCA-DR-OF			581	217	12719
	YEL-OTB		42			107
spinytail skate	GRO-OTB		16532			18
	SCA-DR-OF					7049
sponges	GRO-GNS	1096				
	GRO-OTB	4052	761			817
	GRO-OTB-OF	3521	42			
	SCA-DR-OF				33555	24098
	YEL-OTB		237			295
spotted wolffish	GRO-LLS					14
	GRO-OTB-OF					5
	SCA-DR-OF				343	
squid	GRO-OTB	573	560	269	122	2917
	GRO-OTB-OF		110	84		281
	SCA-DR-OF			73	170	2070
	YEL-OTB				6	2
starfish	GRO-LLS	111		10	187	27
	GRO-OTB		88	34	78	58
	GRO-OTB-OF		42		10	33
	LBA-FPO-OF				44	
	SCA-DR-OF				65352	12791
	YEL-OTB		14			11
striped atlantic wolffish	GRO-GNS		46			
	GRO-LLS	74	187	338	762	302
	GRO-OTB			1073	623	80
	GRO-OTB-OF			753	96	48
	SCA-DR-OF				13298	2368
	YEL-OTB				32	
swordfish	GRO-LLS			1402		
	SWO-LL	6737	10569			7303

5Z Species	Fishery	2002	2003	2004	2005	2006
thorny skate	GRO-LLS	104706	29316	41727	21883	7383
	GRO-OTB	246105	225181	105572	12043	15725
	GRO-OTB-OF	180	39112	1540	1370	4486
	M-GS					17
	SCA-DR-OF			443256	50496	10699
	YEL-OTB		251922	197973	5521	1
tile fish	GRO-OTB			9		
turbot	GRO-OTB	530				
unid. fish	SCA-DR-OF	7697603		74	50	
whelks	GRO-LLS			10		
	SCA-DR-OF				3456	8342
white hake	GRO-LLS		10	8110		
	GRO-OTB	26				9
	LBA-FPO-OF	1962	1164		1661	1302
	SCA-DR-OF			25534	2305	6020
	YEL-OTB					1
winter skate	GRO-LLS	7535	12185	12759	1984	16275
	GRO-OTB	594933	341745	17182	26416	27682
	GRO-OTB-OF	188187	41384	562	12319	5843
	M-GS					17
	SCA-DR-OF			473972	1322449	581634
	YEL-OTB		390	976	11462	1982
yellowtail flounder	GRO-OTB	238	73	17		24
	GRO-OTB-OF					12
	SCA-DR-OF	1065483		66564	248537	627193

Appendix 3. Discards (kg) for area, discarded species and year by fishery to support the broad comparisons made in this analysis. Particular estimates should not be construed as definitive or accepted uncritically.

4VW Fishery	Species	2002	2003	2004	2005	2006
CRJ-FPO	american lobster	20369				
	cod(atlantic)	554				
	cusk	2197				
	Jonah crab	132243				
	northern stone crab	1204				
	other hakes	879				
	red deepsea crab	1605				
	redfish	229				
	sculpin	974				
	striped atlantic wolffish	1643				
	white hake	1070				
CRQ-FPO	american lobster	264	339	384		
	cod(atlantic)	126	113	282	10	
	jellyfish			192		
	Jonah crab	459	441	77		
	leatherback sea turtle				6268	2396
	northern shrimp				10	
	northern stone crab	850	486	448		96
	other crabs	563	5472	166	41	24
	other flounders	11	23	51	20	
	redfish	57			10	48
	rock grenadier(roundnose)				10	
	scallop		23		10	
	sculpin	23			10	
	sea cucumbers	11	23		61	24
	sea urchins					12
	snow crab	2392795	1726627	1235278	1127031	999516
	spotted wolffish		23	474		60
	starfish			13	71	
	striped atlantic wolffish	23	11	154		60
	thorny skate	23	102	13	10	36
	threadfin seasnail				10	
	toad crab	253	23			
	turbot			26		
	white hake	69				
	winter skate	46				
CUK-DR	atlantic rock crab				47	
	cod(atlantic)				23	
	haddock				2	
	mackerel(atlantic)				2	
	ocean quahaug				6	
	other crabs				116	
	other flounders				76	
	other hakes				2	
	sand dollars				175	

4VW Fishery	Species	2002	2003	2004	2005	2006
CUK-DR	scallop				75	
	sculpin				56	
	sea cucumbers				754	
	sea mouse				20	
	sea urchins				230	
	silver hake				17	
	snow crab				308	
	starfish				41	
	white hake				8	
GRO-LLS	barndoor skate	178	139	2097	2548	13875
	basking shark		19255			
	bird	379		676		
	blue shark				4899	
	cod(atlantic)	22	35	338	3625	
	coral		35			
	cusk		131		4311	
	haddock	22				
	halibut(atlantic)	39659	32050	24352	35274	4625
	Jonah crab	22	35		196	
	northern hagfish		35		196	
	northern stone crab		69	68	98	
	northern wolffish		13448	20902	11170	1034705
	off-shore hake			135		
	other dogfish	24291	52662	17385	16363	70214
	other sharks					1210870
	other skates	67				
	redfish		17			
	sculpin		17			
	sea corn	45	39			
	snow crab	45	432	1082	980	
	spiny dogfish	4127	1334	1015	980	
	spinytail skate		828			
	spotted wolffish			26517	1470	3364
	striped atlantic wolffish				784	
	thorny skate	3100	5285	6426	48110	
	turbot				196	
	white hake	1718	917		5487	
	winter skate	1985	1238		13914	24806
	wrymouth				686	
GRO-OTB	alewife		19088			
	american lobster	19				9183
	butterfish	94				3360
	cod(atlantic)		32			
	eggs		32			
	halibut(atlantic)	245	226			224
	herring(atlantic)	94				
	jellyfish		258			
	lumpfish		129			

4VW Fishery	Species	2002	2003	2004	2005	2006
GRO-OTB	mackerel(atlantic)		65			
	monkfish		129			
	northern shrimp		161			
	northern stone crab	141	614			
	other flounders		129			
	other grenadiers	9				
	other sharks	2355				
	other skates	113	129			
	redfish	283	97			
	sand lance		65			
	sculpin	141	1873			112
	sea cucumbers		4909			
	silver hake		32			
	smooth skate		1001			
	snow crab		4683			
	spiny dogfish	1036				
	sponges	8270				
	squid	9				
	starfish		65			
	thorny skate	3316	61559			
	white hake		32			
	winter skate	188	51773			
GRO-OTB-OF	alewife	4015				
	american lobster	138				
	argentine	793				
	butterfish	34	42			
	capelin		21			
	eelpout		127			
	halibut(atlantic)	1361	1568			
	herring(atlantic)	10340	106			
	jellyfish	130	1081			
	lumpfish	1344	1964			
	mackerel(atlantic)	258				
	monkfish		136			
	northern stone crab		127			
	other dogfish	1491	29905			
	other shrimp	19				
	other skates	172	212			
	porbeagle	1446				
	sculpin	896	42			
	shad american	52				
	shortspine tapirfish	345				
	smooth skate	362	487			
	snow crab	17	21			
	spiny dogfish	22144	233			
	sponges		2120			
	squid	264				
	starfish	69				

4VW Fishery	Species	2002	2003	2004	2005	2006
GRO-OTB-OF	thorny skate	4304	2412			
	winter skate	10098	1123			
GRO-OTM-OF	barndoor skate				80	
	jellyfish				2608	
	lumpfish				135	
	northern stone crab				4	
	northern wolffish				80	
	other dogfish				261	
	spiny dogfish				41	
HER-PS	herring(atlantic)	554				
	spiny dogfish	135				
HKS-OTB	alewife		418	28290	285	11213
	american lobster	55				2756
	argentine		35			
	atlantic rock crab	27				109
	barndoor skate			599		
	basking shark				70541	
	butterfish		279			818
	cod(atlantic)		1080			
	cusk		35			27
	dolphin	4114				
	eelpout		70			
	haddock		1254			
	halibut(atlantic)		35		1221	6548
	herring(atlantic)	31704	8256	61776	140716	7994
	Jonah crab		139			
	mackerel(atlantic)		35	737	1210	7885
	monkfish		209	138	1484	
	northern wolffish			46		
	off-shore hake		35			
	other flounders		4006			
	other hakes		25222	230	2132	
	other shrimp				41	
	other skates	27	488	330		82
	pollock		975		267	
	redfish		1916	323	1266	
	rosefish(black belly)		35			
	scallop				326	
	sculpin		70		41	27
	shad american					218
	silver hake		2439	461	21350	
	smooth skate	137	557			5156
	spiny dogfish	2029	6096	37682	5256	1119
	squid	1508	105	1582	51091	33175
	striped atlantic wolffish					27
	swordfish	1508				
	thorny skate	27	244		326	3792
	turbot		35			

4VW Fishery	Species	2002	2003	2004	2005	2006
HKS-OTB	white hake		348		1333	
	winter skate					12823
HM-OTM	alewife					4183
	bluefin tuna					2259
	herring(atlantic)				450	356
	Jonah crab					2
	mackerel(atlantic)					189
	monkfish				2	
	pollock					3
	porbeagle				30	276
	sand lance					67
	snow crab					3
	spiny dogfish					45
	sponges					2
	squid					6543
M-ST2	blue shark			6175		
	leatherback sea turtle			611		
	loggerhead sea turtle			168		
	other turtles			46		
	porbeagle			631		
	shortfin mako			31		
	swordfish			137		
PAN-OTS	alewife			38	101	140
	alligatorfish				203	
	american eel			1384		280
	atlantic saury			114		
	atlantic sea poacher				3954	419
	capelin			641	4867	
	cod(atlantic)			26	203	419
	cusk			13		
	eelpout			1079	16020	5172
	fish doctor				101	
	fourbeard rockling					419
	herring(atlantic)			3430	40152	140
	northern shrimp				42180	5871
	off-shore hake			9		
	other flounders			18010	101192	16076
	other hakes				406	
	redfish			1908	23017	979
	sand lance			3	101	
	scallop			3		
	sculpin			564	101	
	silver hake			1219	1115	47530
	snake blenny				710	
	snow crab			222	913	839
	squid			1807	811	559
	starfish			54		
	striped atlantic wolffish				304	

4VW Fishery	Species	2002	2003	2004	2005	2006
PAN-OTS	thorny skate			234	2433	
	turbot			22763	4461	140
	white hake			12		
RED-OTB	american lobster	205				
	barndoor skate			314		
	eel			288		
	halibut(atlantic)		101			
	herring(atlantic)		51			
	jellyfish			2332		
	monkfish		13			
	other crabs			131		
	other dogfish			5634		
	other grenadiers			262		
	other shrimp			183		
	smooth skate	256		9958		
	spiny dogfish	45410	355			
	spotted wolffish			288		
	squid			341		
	starfish			131		
	thorny skate		13	13365		
RED-OTB-OF	argentine					1415
	eelpout					14
	halibut(atlantic)					513
	jellyfish			284		42
	monkfish					513
	northern wolffish					42
	octopus					14
	other crabs			47		125
	other dogfish			2464		20016
	other grenadiers					638
	other hakes					69
	other skates					2205
	redfish					27742
	sea anemone					42
	silver hake			46		
	spiny dogfish					14
	sponges			274		153
	spotted wolffish			47		208
	squid					694
	starfish			9		
	thorny skate			728		
SHX-LL	barndoor skate				1560	
	blue shark	2309				
	bluefin tuna	94				
	lamprey	4				
	lancetfish	67				
	monkfish	10		43		
	other tuna	185				

4VW Fishery	Species	2002	2003	2004	2005	2006
SHX-LL	porbeagle	891				
	spiny dogfish	55			217	
	thorny skate			107		
	winter skate	25				
SKW-OTB	american lobster			62		
	barndoor skate			10		
	capelin			5		
	haddock			5		
	halibut(atlantic)	9		88		
	Jonah crab			15		
	lumpfish	18		134		
	marine invertebrates (ns)			26		
	monkfish			180		
	northern shrimp			57		
	northern stone crab	40		155		
	other crabs			10		
	other flounders			21		
	redfish			10		
	sculpin			495		
	sea urchins			10		
	shad american			10		
	smooth skate			108		
	snow crab	40		3338		
	spiny dogfish	124		5		
	sponges			26		
	starfish			10		
	striped atlantic wolffish			10		
	thorny skate	581		13157		
	toad crab			26		
	winter skate	15910		94701		
SWO-LL	bird	1266		187		
	blue shark	446831	495041	405647	517449	847054
	bluefin tuna	17629	32632	22512	2093	5245
	dolphin		900			
	fathead				942	
	lancetfish	449	977	685	1465	1056
	leatherback sea turtle	8677	25844	19729	40531	6199
	loggerhead sea turtle	6942	70459	1038	29753	34129
	mahi mahi	265	463		907	
	marlin		20238		23963	36343
	monkfish	31			314	
	ocean sunfish	3552			6976	
	opah					1601
	other sharks	3450		5711	17963	29735
	other tuna	2950	2623	1973	3279	4871
	other turtles			1661	26614	
	porbeagle	12342	39293	15056	29369	31983
	ray	694	1594	83	6453	2146

4VW Fishery	Species	2002	2003	2004	2005	2006
SWO-LL	seals (ns)		3472			
	shortfin mako	929	16303	8245	22533	10933
	snake mackerel	184				2112
	swordfish	15608	72774	11734	42135	22242
TUN-LL	bird	51				
	blue shark	8637	2104		95253	39274
	bluefin tuna	90	123			414
	lamprey					1
	lancetfish	7				56
	leatherback sea turtle					581
	loggerhead sea turtle				1018	4841
	mahi mahi					14
	marlin					481
	monkfish	1			41	3
	ocean sunfish					895
	opah					3
	other sharks					987
	other tuna					227
	other turtles					204
	porbeagle	313	1712		1018	1715
	ray				244	927
	shortfin mako				61	466
	snake mackerel					10
	swordfish	166			713	1107

4X5Y Fishery	Species	2002	2003	2004	2005	2006
BFT-LHP	blue shark	557		5019		
	shortfin mako			2868		
BFT-LTL	blue shark	4732				
	mackerel(atlantic)					429
	marlin	6890				
	other tuna				389	
CRQ-FPO	american lobster			75		
	atlantic rock crab	944				
	Jonah crab	1036			2685	24
	northern stone crab	1267	1515		582	142
	other crabs	46		635		
	red deepsea crab				90	
	sculpin	92			90	
	seals (ns)	921				
	snow crab	169323	903186	83388	67442	52679
	thorny skate	23				
	toad crab			187		24
CUK-DR	american lobster				9736	
	atlantic rock crab				4520	
	cunner				695	
	Jonah crab				4520	
	mussels				2434	
	ocean quahaug				348	
	other flounders				2086	
	redfish				348	
	scallop				695	
	sculpin				3825	
	sea urchins				695	
	seaweed				2086	
	smooth skate				695	
	sponges				7650	
	starfish				29556	
GRO-GNS	alewife			185		
	american lobster	69006	7392	8222	39904	
	argentine				1676	
	atlantic rock crab				5585	
	barndoor skate				621	
	bird			647	1427	
	cod(atlantic)		31171	924	9743	
	coral		356			
	haddock				62	
	halibut(atlantic)				62	
	herring(atlantic)			277		
	Jonah crab	57505	47914	16721	8998	
	lumpfish				2420	
	northern stone crab		89		186	
	other flounders				372	

4X5Y Fishery	Species	2002	2003	2004	2005	2006
GRO-GNS	other skates			185	124	
	other sturgeon				4034	
	pollock		43906	3788	8130	
	porbeagle		36960	7391		
	redfish	46004		370	62	
	scallop		89		62	
	sculpin			92	683	
	shad american		89	1940	42200	
	shortfin mako				35560	
	silver hake		178	1848	62	
	smooth skate				62	
	spiny dogfish	4893694	482347	899346	946703	
	starfish		356	92		
	thorny skate				621	
	white hake		70980	277	27430	
GRO-LLS	american lobster		7342	349	269	
	atlantic rock crab				90	
	barndoor skate	1356	182976	94879	141320	60591
	bird	2441	376		448	
	blue shark		11295	3139		
	cod(atlantic)		3012			
	coral		376			594
	cusk		565			
	haddock		4894	930	1882	
	halibut(atlantic)	27934	84335	12906	46688	9207
	Jonah crab	814				
	northern stone crab		565		358	1188
	northern wolffish				12277	
	off-shore hake				90	
	other crabs					297
	other dogfish				1075	116726
	other hakes	814				
	other skates	121229	9412	144877	7886	
	pollock		376			
	porbeagle	6238				
	red deepsea crab				627	
	redfish	814				
	rosefish(black belly)	5153				
	sculpin	271	2824	1279	1075	594
	sea anemone		188			
	sea corn		3388			5940
	smooth skate		45744	1279	896	
	spiny dogfish	514205	470430	141738	717712	847673
	starfish		188	116	448	
	striped atlantic wolffish		9036			
	thorny skate	133162	281618	54997	27601	7425
	white hake				1792	
	winter skate		565	1046	20432	125339

4X5Y Fishery	Species	2002	2003	2004	2005	2006
GRO-OTB	alewife	2566	4298	5719	318	
	alligatorfish		361			
	american lobster	29559	86326	262964	128405	143503
	argentine	170	40		247	
	atlantic rock crab		441		141	
	atlantic torpedo			1448	706	
	barndoor skate		3210	18966	11926	21980
	butterfish	68				
	cod(atlantic)		843		71	
	cusk			3040	141	
	eelpout	1090	2021	1605	3070	
	haddock		1605	11510	494	
	halibut(atlantic)	4221	4454	57361	25369	25027
	herring(atlantic)	27748	5939	1516	1270	
	jellyfish		120	36	106	
	Jonah crab	11851	6902		141	236
	lumpfish	443	1013	5050	7735	5338
	mackerel(atlantic)	35076	40	145	35	
	monkfish		522		1305	157
	northern shrimp			36		
	northern stone crab	34	321	362	212	
	northern wolffish					707
	ocean sunfish				6386	
	off-shore hake			36		
	opah		6019			
	other crabs		161		106	157
	other dogfish	3644				
	other flounders	681	1083	109	141	157
	other grenadiers	204			35	
	other hakes		281		35	
	other shrimp			36		393
	other skates	4223	5979	19799	58831	16672
	other sturgeon			652		
	pollock		80		71	
	porbeagle		5618		4799	10676
	red deepsea crab	238	80			
	redfish		241		35	
	scallop	68			1235	
	sculpin	10591	15551	32330	18030	28339
	sea urchins		120	72		
	seaweed		441		423	2355
	shad american	375	2364	3800	1235	5495
	silver hake	136		1303	35	79
	smooth skate	3916	3732	42829	9280	1963
	spiny dogfish	170763	34635	2078748	308593	737357
	spinytail skate			109		
	sponges	9637			1799	
	squid	68	120	716	141	

4X5Y Fishery	Species	2002	2003	2004	2005	2006
GRO-OTB	starfish	7901	7744	20450	459	79
	striped atlantic wolffish			1882	565	3335
	thorny skate	17742	30086	94989	19547	62408
	toad crab	34				
	white hake		321	4597		
	winter skate	391	34588	128143	67674	112570
GRO-OTB-OF	alewife	273	2152			
	alligatorfish	45				
	american lobster	3152	12578	12767		9407
	argentine	542	67	21		
	atlantic torpedo	184				
	barndoor skate	348	2085			1646
	butterfish	163				
	coral		22			
	cusk	29				
	eelpout	4				
	haddock	122				
	halibut(atlantic)	799	404	252		
	herring(atlantic)	2410	986	63		
	Jonah crab	4	45			
	lumpfish	330	112	21		
	mackerel(atlantic)	8846	202			
	monkfish	212				
	northern hagfish	4				
	northern stone crab		22			
	octopus	4				
	off-shore hake	216				
	opah	4				
	other flounders	190				
	other grenadiers	4	22			
	other hakes	12				
	other skates	3021	336			
	pollock	184				
	porbeagle	204		968		
	redfish	3707				
	rock grenadier(roundnose)	4				
	roughhead grenadier	4				
	sculpin	1847	785	84		
	shad american	814	1166	379		
	shortfin mako	277				
	silver hake	1028	291			
	smooth skate	759	673	1115		
	spiny dogfish	105611	74862	272971		253
	sponges	1411				
	squid	387				
	starfish	8	112			
	striped atlantic wolffish	73				
	thorny skate	5167	3296	2692		747

4X5Y Fishery	Species	2002	2003	2004	2005	2006
GRO-OTB-OF	white hake	204	45			
	winter skate	832	112	5742		367
HER-PS	blue shark	510				
	cod(atlantic)	510	2160	3383		
	herring(atlantic)	16595587	16227797	3470772	149851	
	lumpfish			24	150	
	monkfish			213		
	other dogfish	5102				
	other flounders			24		
	other sharks		635	3549		
	porbeagle	13649	3177			
	seaweed		101662			
	shad american			24		
	shortfin mako			8281		
	spiny dogfish	501439	519112	67688		
	squid			24		
	whales (ns)			828064		
HKS-OTB	alewife	20		1459		3740
	american lobster	730	3802	212		
	argentine	1304	271			
	atlantic rock crab		452			
	atlantic torpedo	51	90			
	barndoor skate			278		
	basking shark			15593		
	butterfish	269				
	coral	30				
	dolphin		1851			
	eelpout	90				
	halibut(atlantic)	2069	36	11		
	herring(atlantic)	537		178		4538
	jellyfish	10				
	Jonah crab	30	154			
	lamprey	10				
	lumpfish	50				
	mackerel(atlantic)	20		33		6783
	monkfish	696				
	northern stone crab	30				
	octopus	10				
	off-shore hake	102				
	other flounders	366	54			
	other grenadiers	254				
	other hakes	2219				
	other skates	5212	3341			
	red deepsea crab	10				
	redfish	70				
	rosefish(black belly)	1910				
	scallop		9			
	sculpin	905	45			

4X5Y Fishery	Species	2002	2003	2004	2005	2006
HKS-OTB	sea anemone	10				
	shad american	30				
	silver hake	6094		2940		
	smooth skate	60				
	snow crab	30				
	spiny dogfish	87841	50057	59266	147	249
	sponges	10				
	spotted wolffish		81			
	squid	498	163	33		
	starfish		208			
	thorny skate	949	298			
	white hake	219	18			
	winter skate	288	18	223		
LBA-FPO-OF	american lobster	124987	137484	478357	204645	204235
	atlantic rock crab	360		606	253	
	cod(atlantic)	135	2017	1161	955	1201
	cusk	13130	11758	20133	16445	9057
	finfishes (ns)					177
	haddock		443	101	331	12
	Jonah crab	65156	74068	193866	87972	43023
	monkfish			252	97	25
	northern stone crab	113				
	northern wolffish				156	
	other hakes	288	1427	959	1754	1802
	redfish	182	49	101	273	337
	rosefish(black belly)	735	221	202	234	87
	sculpin		172	303	19	77
	sea anemone	40				
	sea urchins	40				
	silver hake	23				
	smooth skate				19	
	spiny dogfish				58	
	starfish	40			39	50
	striped atlantic wolffish			1615	195	62
	white hake	1531	492	2018	1150	262
RED-OTB	alewife	216		1783	459	141
	american john dory	4				
	american lobster	10877	49518	34563	60792	4779
	argentine	468	37		184	226
	atlantic rock crab		4154	3327	23417	28
	atlantic torpedo	260			337	
	barndoor skate	55	1372	2570	30763	1188
	barracudina				31	
	basking shark	3934				
	butterfish	8				
	cod(atlantic)	35				
	eel				31	
	eelpout	433	111	352	2112	

4X5Y Fishery	Species	2002	2003	2004	2005	2006
RED-OTB	haddock	8				
	halibut(atlantic)	1758	1372	866	1592	283
	herring(atlantic)	1621	223	216	643	198
	jellyfish	8			92	28
	Jonah crab	4524	15022	18907	21458	
	lamprey		37			
	lanternfish	20				
	lumpfish	315		487	520	226
	mackerel(atlantic)	67		27	61	28
	monkfish	47				
	mussels	4	556	54		
	northern stone crab	63			61	28
	northern wolffish	12				
	octopus				31	
	off-shore hake	193			398	
	other crabs	16				
	other dogfish				184	12866
	other flounders	142	445	4679	8387	
	other grenadiers	138			92	
	other hakes	618			582	
	other skates	4658	12055	491	14540	650
	other sturgeon	413			2755	
	pollock	8				
	red deepsea crab	4			275	
	redfish	1251	18546			1272
	rock grenadier(roundnose)				31	
	rosefish(black belly)	24				
	scallop	59	3264	947	3153	
	sculpin	1503	705	811	92	170
	sea anemone	12	37			
	seaweed	4				
	shad american	456		27	1163	311
	silver hake	763		520	1775	
	smooth skate	429	260	135	520	170
	snow crab	20				
	spiny dogfish	145698	171736	217859	205638	305393
	sponges	24				28
	spotted wolffish	20	74			
	squid	43	37	54	245	85
	starfish	287	21847		214	
	stout sawpalate				61	
	striped atlantic wolffish	35				
	thorny skate	3674	8717	5491	367	198
	turbot	4				
	white hake	539				
	winter skate	448		1677	1531	

4X5Y Fishery	Species	2002	2003	2004	2005	2006
RED-OTB-OF	alewife			1237	122	116
	american john dory					43
	american lobster		290	3215	773	8238
	argentine			76		840
	barndoor skate		1068	1065	271	1752
	basking shark			38907		
	dolphin			2568		
	halibut(atlantic)			3900	163	72
	herring(atlantic)		168	628	14	
	lumpfish				68	58
	mackerel(atlantic)				14	
	other flounders			19		
	other hakes			171		
	other skates				597	
	sculpin			57	122	623
	shad american			9684	27	825
	silver hake		122	95		
	smooth skate		717		976	
	spiny dogfish			25779	529399	23152
	striped atlantic wolffish					130
	thorny skate			1522	27	1100
	tile fish		351	57		
	winter skate					1737
SCA-DR	alligatorfish				84	
	american lobster	36900	66876	26351	36195	75873
	atlantic rock crab	152594	152817	82705	36919	198298
	barnacles					2231
	barndoor skate	446				57
	bivalve	1027	56757	225308	152672	8048
	clam	179		313120	12981	
	cod(atlantic)	312	1332	348	171	432
	coral					1612
	cusk		89			
	eelpout	89	178	433		124
	eggs					992
	haddock	313	266			66
	halibut(atlantic)		472	52		
	helocid pteropod				5025	
	hydrozoa	89				
	jellyfish	45	622			
	Jonah crab	74585	242094	105786	125022	118906
	lamprey			66		
	lumpfish		120		97	124
	mollusca sp.	1161	5285			
	monkfish	69125	30365	18269	10872	6969
	mussels	110887	162882	226571	284392	304532
	ocean quahaug				84	
	octopus		245			

4X5Y Fishery	Species	2002	2003	2004	2005	2006
SCA-DR	other crabs	107237	41631	35362	31052	24567
	other flounders	6918	9293	14610	4876	4207
	other skates	18484	60245	21142	9408	19344
	pelagic sea snail			1628	1340	1033
	pollock	45				
	pricklebacks					41
	puffer					57
	redfish			179	227	107
	sand dollars			165		289
	sand lance		89		144	
	scallop	699968	1259357	1389390	1640546	658213
	sculpin	94025	116124	106577	93337	103008
	sea anemone		156			248
	sea cucumbers	84478	14163	58398	494405	490593
	sea peach					1281
	sea potato					248
	sea squirt					455
	sea urchins	100666	43297	20050	94132	69670
	seaweed	179	257563	55148	586	1984
	shrimp		1332		84	41
	smooth skate	14508	2043	3906	5025	248
	snails and slugs	580	7017			661
	snow crab					2603
	spiny dogfish		1332			
	spinytail skate		533			
	sponges	233742	131922	208890	158953	22810
	squid			460		
	starfish	507643	504617	845951	374673	416043
	striped atlantic wolffish			888	335	124
	thorny skate	2464	28940	19882	11231	12063
	toad crab				335	744
	unid. fish					7645
	whelks					2645
	white hake	45				
	winter skate	10223	21447		18827	4625
SCA-DR-OF	american lobster			7564		
	atlantic rock crab			33429		
	barndoor skate			458		
	cod(atlantic)			17064		
	cusk			136		
	eel			229		
	eelpout			1145		
	haddock			9532		
	halibut(atlantic)			2185		
	herring(atlantic)			458		
	Jonah crab			7082		
	lumpfish			545		
	monkfish			228811		

4X5Y Fishery	Species	2002	2003	2004	2005	2006
SCA-DR-OF	other flounders			120808		
	other hakes			2655		
	other skates			43962		
	pollock			229		
	redfish			594		
	scallop			1784140		
	sculpin			38607		
	sea cucumbers			8701		
	silver hake			4666		
	starfish			108148		
	striped atlantic wolffish			13878		
	thorny skate			27833		
SCU-OTB	alewife				19	30
	american atlantic sturgeon					68
	american lobster	4900	6195	7600	11078	12954
	atlantic rock crab		3371	1788	6369	4277
	butterfish					1
	capelin					1
	clam				4	30
	cod(atlantic)			4	2	7
	cunner					9
	eelpout	279	49	42	92	198
	halibut(atlantic)		14	19	13	19
	herring(atlantic)				85	263
	jellyfish					5
	Jonah crab	12357	3525	3403	3730	3146
	lumpfish			44	17	68
	mollusca sp.				4	23
	monkfish					1
	mussels	4	273	2	2	65
	northern shrimp				64	9
	other crabs				32	
	other flounders	175	655	1671	1214	1227
	other skates	25		10	2002	3370
	other sturgeon	250		57	353	49
	pelagic sea snail					1
	rainbow smelt				34	30
	sand lance					1
	scallop	32	498	1284	549	558
	sculpin			10	2	49
	sea cucumbers	7			6	8
	sea urchins					20
	shad american				6	4
	shrimp				85	1
	silver hake					14
	snake blenny				2	11
	sponges				4	9
	squid					12

4X5Y Fishery	Species	2002	2003	2004	2005	2006
SCU-OTB	starfish	21	4026	94	278	266
	thorny skate	954	971	1589	1666	981
	whelks				6	
	white hake					64
	winter skate				752	362
	wrymouth				2	27
SHX-LL	blue shark	393				
	porbeagle	702				
	spiny dogfish	393				
	white hake	56				
SKW-OTB	american lobster		3111	12602		
	barndoor skate		283			
	halibut(atlantic)			3934		
	herring(atlantic)		162			
	Jonah crab		81			
	lumpfish			266		
	other grenadiers		40			
	shad american			19280		
	silver hake		202			
	smooth skate		1172	2430		
	snow crab			78		
	spiny dogfish			2680		
	striped atlantic wolffish			47		
	thorny skate			4436		
	winter skate		202			
SWO-LL	barracudina				526	
	bird	8	31			
	blue shark	166882	77202	44538	63084	87187
	bluefin tuna	27722	6521			
	cutlassfishes (ns)				841	
	lancetfish	1153	655		158	
	leatherback sea turtle	29273	24023		18399	72789
	loggerhead sea turtle	8243	2340		6046	159976
	mahi mahi	663			158	
	marlin	9246			35642	62391
	monkfish		94			
	ocean sunfish	5598				
	other sharks	3674	4227			
	other tuna	7604	156		26968	
	other turtles				12880	
	porbeagle	5498	11356			
	puffer				210	
	ray	5150	406		1998	21997
	shortfin mako	3914	905			46393
	snake mackerel	589			4416	
	swordfish	17962	11902	4454	12249	54392
SWO-LTL	bluefin tuna	2316	741			

4X5Y Fishery	Species	2002	2003	2004	2005	2006
TUN-LL	bird					2
	blue shark				1860	21800
	bluefin tuna				64	426
	dolphin					519
	lancetfish					17
	leatherback sea turtle				210	1039
	loggerhead sea turtle					303
	mahi mahi					47
	marlin					147
	ocean sunfish					173
	other sharks					814
	other tuna					242
	porbeagle				17	248
	ray					17
	remora					3
	shortfin mako					258
	swordfish				101	379

5Z Fishery	Species	2002	2003	2004	2005	2006
BFT-LTL	blue shark				3584	
GRO-GNS	american lobster	76	46	70		
	barndoor skate	346				
	bird	261				
	coral		213			
	haddock		37			
	sculpin	34				
	sea corn	84				
	spiny dogfish	17				
	sponges	1096				
	striped atlantic wolffish		46			
GRO-LLS	american lobster	74	155	238	625	732
	barndoor skate	31122	47796	29691	35484	77915
	basking shark			60558		
	bird	74	39		100	
	blue antimora/hake		10			
	blue shark	12657	6693	3589		2568
	cod(atlantic)			52		
	coral	260	177	206	62	
	cusk		13209	8050		27
	eelpout	19			12	
	haddock		69	4255	125	6332
	halibut(atlantic)	1169	2389	2020	1312	3154
	Jonah crab	19	10	10		
	lobster					14
	monkfish				244	
	mussels				12	
	northern stone crab		10			
	northern wolffish			165		
	other dogfish	74		866		
	other hakes	56	30			
	other sharks	13473	8947	27393		
	other skates	17185	23091	32591	5886	2033
	pollock	928				41
	porbeagle		226		1887	
	redfish	575	187	502		165
	rosefish(black belly)	334			1312	1250
	roughhead grenadier	186				
	scallop	37		10	150	14
	sculpin	19		82	203	55
	sea anemone	19				
	sea corn	334	738	1711	150	
	shortfin mako			175		
	smooth skate		7845		3087	
	spiny dogfish	1670	177	10357	15797	189629
	spotted wolffish					14
	starfish	111		10	187	27

5Z Fishery	Species	2002	2003	2004	2005	2006
GRO-LLS	striped atlantic wolffish	74	187	338	762	302
	swordfish			1402		
	thorny skate	104706	29316	41727	21883	7383
	whelks			10		
	white hake		10	8110		
	winter skate	7535	12185	12759	1984	16275
GRO-OTB	alewife					6
	american lobster	47650	22553	16650	12076	15959
	argentine	100				15
	atlantic rock crab	384	66			
	atlantic spiny lumpsucker				33	
	atlantic torpedo	2384	331	875	367	15
	barndoor skate	6820	53426	26027	14806	12884
	butterfish	53				3
	clam					107
	cod(atlantic)	199	177	154		205
	coral	243				
	cunner	26	66	43	28	98
	cusk	13	254			21
	eel				178	12
	eelpout	199	464	747	595	174
	grouper,red					6
	haddock	33105	89	584	1718	355
	halibut(atlantic)	108	298	532	773	2440
	herring(atlantic)	29	22	43	39	18
	jellyfish					107
	Jonah crab	79	2075			3
	lamprey					9
	lobster				6	12
	lumpfish				284	547
	mackerel(atlantic)	94	22	86	56	
	monkfish		11	17	345	116
	northern stone crab	26	11			
	northern wolffish				250	
	ocean sunfish				3892	
	off-shore hake		11			
	other crabs				11	
	other dogfish				6	3064
	other flounders	11746	1412	678	128	223
	other hakes	755				18
	other sharks		331			
	other skates	333523	127582	32381	11003	6410
	pollock	33105			356	52
	porbeagle	4644	13254	2489	2018	8713
	ray			43		
	redfish	26	750			9
	rosefish(black belly)	199			6	6
	sand lance					37

5Z Fishery	Species	2002	2003	2004	2005	2006
GRO-OTB	scallop	2332	4734	163	100	260
	sculpin	11936	28416	20186	6800	6646
	sea corn	146				
	sea cucumbers	40	44	9	6	3
	sea robin			9		
	seals (ns)				634	107
	seaweed					31
	shad american	79			50	40
	shortfin mako	6621		215	2018	2963
	silver hake	1311	143	154	6	18
	smooth skate	14558	88951	5012	1273	759
	spiny dogfish	4460	82	1219	183	108655
	spinytail skate		16532			18
	sponges	4052	761			817
	squid	573	560	269	122	2917
	starfish		88	34	78	58
	striped atlantic wolffish			1073	623	80
	thorny skate	246105	225181	105572	12043	15725
	tile fish			9		
	turbot	530				
	white hake	26				9
	winter skate	594933	341745	17182	26416	27682
	yellowtail flounder	238	73	17		24
GRO-OTB-OF	american lobster	7152	3758	2821	4318	13595
	argentine					24
	atlantic rock crab	165				
	atlantic torpedo	589	743	253		68
	barndoor skate	1602	194	1411	4737	6483
	basking shark					897
	bird		17	11		
	cod(atlantic)			101		
	coral		17			
	cunner		127			2
	cusk		8			9
	dolphin					165
	eelpout		17	67	19	19
	haddock				299	5
	halibut(atlantic)	36		28	492	726
	herring(atlantic)				19	
	jellyfish		25			2
	Jonah crab	287	59			
	lumpfish					2
	monkfish			67		78
	northern hagfish		8			
	northern wolffish				222	
	ocean sunfish	1437	169			
	other crabs		17			5
	other dogfish					5

5Z Fishery	Species	2002	2003	2004	2005	2006
GRO-OTB-OF	other flounders		76		48	42
	other sharks	29840	10135			5310
	other skates	92333	11984	2883	494	632
	pollock					101
	porbeagle			253	1312	1194
	redfish				10	
	scallop	1401	110		10	17
	sculpin	3061	2247	641	2084	2039
	sea corn					2
	sea cucumbers		8			9
	seals (ns)					375
	seasnail unidentified			11		
	shad american				48	7
	silver hake		8	6		7
	smooth skate	639	16410	1860	4785	581
	spiny dogfish	12437		1107	135	13859
	sponges	3521	42			
	spotted wolffish					5
	squid		110	84		281
	starfish		42		10	33
	striped atlantic wolffish			753	96	48
	thorny skate	180	39112	1540	1370	4486
	winter skate	188187	41384	562	12319	5843
	yellowtail flounder					12
HER-OTM	american lobster		74			
	blue shark	217				
	haddock	2	670			
	monkfish	22				
	other flounders	10				
	silver hake	101	15			
LBA-FPO-OF	american lobster	29330	148586		119851	174353
	atlantic rock crab		2587			
	cod(atlantic)	2570	2490		3387	306
	cusk	5835	8084		33744	13255
	haddock					26
	Jonah crab	47863	21407		52102	91352
	northern stone crab		97		22	
	other crabs	165				
	other hakes	329	550			128
	red deepsea crab	3788	32			26
	redfish	773	129		66	434
	rosefish(black belly)	165	129			51
	sculpin		162		44	
	sea corn	165				
	snow crab				22	
	spiny dogfish				87	
	starfish				44	
	white hake	1962	1164		1661	1302

5Z Fishery	Species	2002	2003	2004	2005	2006
M-GS	american lobster					13
	barndoor skate					1473
	halibut(atlantic)					158
	sculpin					1
	spiny dogfish					4
	thorny skate					17
	winter skate					17
SCA-DR-OF	alewife				16	
	american eel			73		
	american lobster			148691	80704	69541
	atlantic rock crab			20333	3445	3223
	atlantic saury					33
	atlantic torpedo				148	1465
	barndoor skate			10626	34638	79596
	bivalve				135	2531
	clam				1552	
	cod(atlantic)	122834		139831	77911	134756
	cunner			3268	886	569
	eel			444	273	196
	eelpout			22093	20415	17270
	eggs				3647	1013
	haddock	40353		103920	48828	70410
	halibut(atlantic)			2332	482	336
	herring(atlantic)			218		
	jellyfish					59
	Jonah crab			27344	11667	747
	lanternfish				16	
	lumpfish			10059	39	
	marine invertebrates (ns)				127471	60012
	mollusca sp.				6459	
	monkfish	138433		1875528	949341	1091887
	mussels				3440	270
	ocean quahaug				153	1772
	off-shore hake				33	63
	other crabs			17251	73733	60465
	other flounders			440044	165060	247484
	other hakes			9463	3139	20937
	other skates			1921060	303048	933716
	other tuna				617	
	periwinkles				2920	5831
	pollock	582		1384	129	51
	redfish				20	
	sand lance					182
	scallop	108785		7511336	2728163	1415519
	sculpin			587455	231977	425559
	sea cucumbers				5203	6263
	sea robin				17	162
	sea urchins			1145	13164	9566

5Z Fishery	Species	2002	2003	2004	2005	2006
SCA-DR-OF	seals (ns)				172	
	seaweed					21521
	shrimp			171795		
	silver hake			7900	2617	3763
	smooth skate			47586	8087	1098
	snails and slugs				9111	
	spiny dogfish			581	217	12719
	spinytail skate					7049
	sponges				33555	24098
	spotted wolffish				343	
	squid			73	170	2070
	starfish				65352	12791
	striped atlantic wolffish				13298	2368
	thorny skate			443256	50496	10699
	unid. fish	7697603		74	50	
	whelks				3456	8342
	white hake			25534	2305	6020
	winter skate			473972	1322449	581634
	yellowtail flounder	1065483		66564	248537	627193
SWO-LL	blue shark	28583	61254			30226
	bluefin tuna	2915	36934			
	dolphin	376				
	leatherback sea turtle	7757				21523
	loggerhead sea turtle	2558	3409			1567
	marlin	564				
	ocean sunfish	621	9091			
	other sharks	899	3637			3134
	other tuna	327	341			
	other turtles		6250			
	porbeagle		1818			8254
	ray	1083	682			282
	shortfin mako	169				512
	snake mackerel					42
	swordfish	6737	10569			7303
YEL-OTB	american lobster		8667	3844	381	113
	barndoor skate		1533	23145	1042	867
	clam					38
	cunner		70			2
	eelpout			39		
	haddock			151		
	halibut(atlantic)			112		
	Jonah crab				6	1
	lamprey			68		
	mackerel(atlantic)			10		
	other dogfish					2
	other flounders			220		
	other skates			3497	3399	51
	ray			24		

5Z Fishery	Species	2002	2003	2004	2005	2006
YEL-OTB	scallop		1059	151		76
	sculpin		1073	4468	210	168
	sea robin			5		
	seaweed					11
	shad american			5		
	shortfin mako					150
	smooth skate			2019		1
	snails and slugs					2
	spiny dogfish		42			107
	sponges		237			295
	squid				6	2
	starfish		14			11
	striped atlantic wolffish				32	
	thorny skate		251922	197973	5521	1
	white hake					1
	winter skate		390	976	11462	1982